

that sequence. Thereafter follow the tribes of the *Pooideae* in strictly alphabetical order. Within each tribe the genera, within each genus the species, are arranged similarly in alphabetical succession.

Thus the plan is a severely practical one and there is no suggestion in the position of any tribe or lesser taxon of a phylogenetic arrangement. The object is purely utilitarian, namely to arrive at the name of a plant as rapidly and conveniently as may be. It is not possible, even if it were desirable, to indicate phylogenetic relationships in a linear treatment of the species in any family since tribes, genera, etc., cannot possibly have arisen from one another in linear succession.

All that has been done in this book is to arrange in groups (tribes), genera which seem to be related because of their morphological characteristics and, also, foliar anatomy, chromosome-numbers, etc., so far as these are known.

It is not by any means claimed that these groupings are correct. Indeed it is quite clear, from knowledge gained since this book went to press, that at least two genera, *Gymnopogon* (see page 66) and *Indopoa* (BOR, 1958), are misfits in the tribes in which they have been placed.

In spite of the spate of papers on subjects relating to the taxonomy of the grasses, our knowledge is pitifully small in comparison with the size of the family.

So far, published classifications have been based wholly on morphological characteristics or partly on these characteristics modified by anatomical and cytological data which are by no means adequate, and partly on personal evaluation.

It seems to the writer that we are at the moment witnessing a revolution in ideas concerning the taxonomy of the *Gramineae*. New concepts, new facts, new methods of approach, all contribute to the elucidation of this most difficult family, but it seems obvious that a great deal more information must be gained before even a tentative scheme with a moderate chance of acceptance can be produced.

THE KEYS

The keys to tribes, genera and species are strictly dichotomous, in which the contrasting sections bear the same number and have the same indentation.

Gramineae A. L. de Jussieu, Gen. Pl. 28 (1789).

ANNUAL or perennial herbs, rarely shrubs or trees with woody stems often reaching a considerable height (some *Bambuseae*); stems jointed, erect or prostrate and creeping at the base and then usually rooting at the nodes, less often erect upon stilt roots (the latter usually developed in forest or shade-loving species and those living in swamps), cylindrical, rarely flattened or quadrangular, hollow in the internodes, solid at the nodes, rarely solid all through; underground root system often well developed in

perennials, extending sometimes to considerable distances by means of rhizomes; stolons, which are sometimes very tough and woody, are developed by some species and spread to considerable distances. In branched culms, at the point where the branching occurs, with its back to the main stem, is developed a two-keeled organ called the prophyllum. Leaves arranged alternately in two ranks on the stems and consisting of sheath, ligule and blade; sheaths surrounding the culm with overlapping free or sometimes connate margins, often swollen at the base, ribbed or smooth; ligule situated at the junction of sheath and blade, membranous or chartaceous, a fringe of bristles or hairs, rarely absent; blades usually long and narrow, rarely broad, ovate, sometimes filiform or setaceous, joined to or jointed upon the sheath with a narrowed, rounded or clasping base, rarely petioled.

Inflorescence various, rarely consisting of one spikelet, more often in spikes, few or many-spiculate panicles, racemes or false racemes in which a sessile spikelet is accompanied by a pedicelled spikelet or its rudiment. Flowers mostly hermaphrodite, sometimes unisexual, usually consisting of stamens and pistil and 2 or 3 minute, hyaline scales (lodicules) representing the perianth or the latter absent, enclosed and sessile between two bracts (lemma and palea), the whole called a floret. Florets, if more than one, alternate in one plane on the opposite sides of a jointed or tough axis (rhachilla), rarely subspirally arranged (*Pommereulla*) with two empty bracts (glumes) at the base of the spikelet, rarely one or both of the glumes absent. Stamens hypogynous, 1-6 (in Indian species), consisting of long delicate filaments and 2-locular anthers, opening usually by longitudinal slits, occasionally by pores; ovary one-celled, with one anatropous, hemitropous or campylotropous ovule usually attached to a point or line on the adaxial side of the carpel, the point of attachment being visible on the grain as the hilum; styles usually 2, rarely 1 or 3; stigmas mostly plumose; fruit 1-seeded, indehiscent, rarely with a mucilage-forming pericarp.

Key to the groups of **Gramineae**

1. Spikelets 2-flowered, falling entire at maturity, usually with the upper floret hermaphrodite and the lower male or barren and if the latter, often reduced to the lemma or rarely the lemma entirely absent, all alike or more often differing in size, shape and structure, frequently dorsally compressed **Panicoideae**
1. Spikelets 1- to many-flowered, breaking up at maturity above the more or less persistent glumes, or if falling entire, then not 2-flowered with the lower floret male or barren and the upper hermaphrodite, usually more or less laterally compressed or terete or if 2-flowered and falling entire, the glumes and lemmas all membranous and with a globose wrinkled seed which splits the palea when mature (*Phaenospemeae*) **Pooideae**

GROUP I

Key to the tribes of Panicoideae

1. Male and female spikelets in separate inflorescences or in different parts of the same inflorescence and of different appearance; lemmas hyaline or membranous and thinner than the glumes **Maydeae**
1. Spikelets all hermaphrodite, or with male or barren and hermaphrodite spikelets mixed in the same inflorescence and so arranged that a male or barren spikelet is near a hermaphrodite spikelet, or if unisexual then the lemma of the fertile floret indurated:—
 2. Spikelets often paired, with one sessile and the other pedicelled, those of each pair similar or more often dissimilar, rarely solitary and all alike; glumes as long as the spikelet and enclosing the florets, more or less rigid and firmer than the lemmas which are both hyaline or membranous; upper lemma usually awned **Andropogoneae**
 2. Spikelets solitary or paired, more or less similar; glumes usually membranous, the lower usually smaller or sometimes suppressed; lower lemma mostly resembling the upper glume in texture; upper lemma papery to very tough and rigid, usually awnless **Paniceae**

PANICOIDEAE—ANDROPOGONEAE

ANDROPOGONEAE Dumort., Obs. Gram. Belg. 84, 141 (1823) as *Andropogineae*.

Spikelets usually in pairs, rarely in threes or solitary, one of each pair or three sessile, the other or both pedicelled; the sessile spikelet most often hermaphrodite, 2-flowered, with the lower floret male or barren or quite absent, the upper hermaphrodite or female; the pedicelled spikelet 2-flowered with the lower male or barren, and the upper male or barren, very rarely hermaphrodite, or both florets absent or the pedicelled spikelet reduced to the pedicel or the latter reduced or entirely absent. Spikelets deciduous from pedicels at maturity, the sessile often with the adjacent joint of the rhachis and pedicel; rhachilla not produced beyond the upper floret. Glumes more or less rigid and firmer than the lemma, the lower always as long as or longer than the florets; lemma membranous or hyaline, the upper sometimes reduced to the hyaline base of an awn or broader, entire, 2-lobed or cleft with a stout geniculate awn from the tip, sinus or cleft; paleas shorter than the lemma, frequently the lower or both absent.

Ovary glabrous; styles 2; stigmas 2, plumose. Grain loosely enclosed by the glumes or lemmas; hilum subbasal, punctiform; embryo large; starch grains simple or compound.

Annual or perennial herbs. Leaf-blades linear, lanceolate or broad, narrowed, rounded, cordate or rarely sagittate at the base, rarely petioled, with panicoid anatomy; silica cells dumb-bell-shaped, or with undulate margins; micro-hairs filiform, 2-celled. Spikelets paniced, racemose or spicate on tough or fragile rhachides. Ligules membranous, a ciliate rim or absent.

Chromosomes small; basic numbers 5, 9-15, 17, 19.

<i>Genera:</i>	<i>Andropogon</i>	<i>Ischaemum</i>
	<i>Apluda</i>	<i>Iseilema</i>
	<i>Apocopis</i>	<i>Lasiurus</i>
	<i>Arthraxon</i>	<i>Lophopogon</i>
	<i>Bhidea</i>	<i>Manisuris</i>
	<i>Bothriochloa</i>	<i>Microstegium</i>
	<i>Capillipedium</i>	<i>Miscanthus</i>
	<i>Chrysopogon</i>	<i>Mnesithea</i>
	<i>Cleistachne</i>	<i>Narenga</i>
	<i>Coelorhachis</i>	<i>Ophiuros</i>
	<i>Cymbopogon</i>	<i>Phacelurus</i>
	<i>Dichanthium</i>	<i>Pogonachne</i>
	<i>Diectomis</i>	<i>Pogonatherum</i>
	<i>Dimeria</i>	<i>Polytrias</i>
	<i>Eccoilopus</i>	<i>Pseudanthistiria</i>
	<i>Elyonurus</i>	<i>Pseudodichanthium</i>
	<i>Eremochloa</i>	<i>Pseudopogonatherum</i>
	<i>Eremopogon</i>	<i>Pseudosorghum</i>
	<i>Erianthus</i>	<i>Ratzeburgia</i>
	<i>Eriochrysis</i>	<i>Rottboellia</i>
	<i>Euclasta</i>	<i>Saccharum</i>
	<i>Eulalia</i>	<i>Schizachyrium</i>
	<i>Eulaliopsis</i>	<i>Sclerostachya</i>
	<i>Germainia</i>	<i>Sehima</i>
	<i>Hackelochloa</i>	<i>Sorghum</i>
	<i>Hemarthria</i>	<i>Spodiopogon</i>
	<i>Hemisorghum</i>	<i>Thaumastochloa</i>
	<i>Heteropholis</i>	<i>Thelepogon</i>
	<i>Heteropogon</i>	<i>Thyrsia</i>
	<i>Hyparrhenia</i>	<i>Triplopogon</i>
	<i>Imperata</i>	<i>Vetiveria</i>
	<i>Indochloa</i>	<i>Vossia</i>

Key to the genera of **Andropogoneae**

1. Spikelets solitary, pedicelled or almost sessile at the nodes of a tough or fragile rhachis; inflorescence of a single raceme or of several racemes:—

2. Rhachis of the racemes not jointed, tough, flat or filiform; spikelets almost sessile or shortly pedicelled, compressed laterally; glumes keeled; keel glabrous or ciliate **Dimeria**
2. Rhachis of the racemes jointed, fragile; spikelets pedicelled, compressed laterally but glumes rounded on the back and not keeled; upper glume with a tuft of hairs in the middle third **Pogonachne**
1. Spikelets in pairs, rarely in threes (see *Polytrias*, *Ischaemum burmanicum*, *Lasiurus*), similar or dissimilar, a sessile and a pedicelled or one short-, the other long-pedicelled, rarely the pedicelled reduced or very rarely the sessile reduced to a scale or two and the pedicelled spikelet developed (*Pogonachne*):—
 3. Spikelets of each pair similar, the sessile and the pedicelled hermaphrodite; the pedicelled very rarely female (*Eriochrysis*), rarely the sessile spikelet male and the pedicelled spikelet hermaphrodite (*Lophopogon*); joints of the panicle thin, linear or somewhat expanded at the top:—
 4. Spikelets arranged in more or less ample panicles or compound racemes arranged along a central axis; upper lemma awnless or awned from the entire tip or from between two terminal teeth:—
 5. Rhachis of racemes tough or tardily breaking up; spikelets deciduous from their pedicels:—
 6. Upper lemma not or hardly two-toothed:—
 7. Lemmas unawned; spikelets in pairs, one sessile, the other pedicelled:—
 8. Panicles narrow, contracted, silvery; glumes very delicate; callus-hairs twice as long as the glumes or more **Imperata**
 8. Panicles broader or widely spreading; glumes indurated, brown or reddish-brown; callus-hairs very short or absent:—
 9. Spikelets oblong, one sessile the other pedicelled; rhachis of racemes tardily breaking up **Narenga**
 9. Spikelets in pairs, ovate or obovate, one short-, one long-pedicelled; rhachis of the racemes tough **Sclerostachya**
7. Lemmas awned:
 - All spikelets pedicelled **Miscanthus**
 - One spikelet pedicelled, the other sessile **Narenga**
6. Upper lemma cleft; branches of the panicle whorled; spikelets all pedicelled **Eccoilopus**
5. Rhachis of the racemes breaking up:—
 10. Spikelets unawned:—
 11. Culm hollow; panicle contracted; sessile spikelet hermaphrodite; pedicelled spikelet female **Eriochrysis**
 11. Culm solid; panicle ample; spikelets similar **Saccharum**

10. Spikelets awned:—
 12. Upper lemma cleft; lower glume rounded on the back or two-keeled, with 5–9 prominent nerves **Spodiopogon**
 12. Upper lemma not cleft or shortly 2-toothed; lower glume 2-keeled with infolded margins **Erianthus**
4. Spikelets arranged in a single or in several racemes, the latter being digitate or arranged along a very short main axis; spikelets in pairs or in threes (*Polytrias*); rarely pedicelled spikelets reduced to pedicel (*Apocopis*):—
 13. Lower glume deeply or shallowly furrowed on the back:—
 14. Raceme solitary; axis flat, tough **Ischnochloa**
 14. Racemes several to many; rhachis fragile; joints clavate to bucciniform **Microstegium**
13. Lower glume more or less flat, very shallowly depressed but not furrowed or rounded on the back:—
 15. Lower glume broadly truncate; pedicelled spikelet much reduced, usually represented by the pedicel only, very rarely present; stamens two **Apocopis**
 15. Lower glume not markedly truncate; pedicelled spikelet developed; stamens usually three, rarely two:—
 16. Upper lemma two-toothed, awned; stamens three **Eulaliopsis**
16. Upper lemma deeply cleft, awned in the cleft, rarely stipitiform:—
 17. Lower glume 2-keeled, depressed between the keels:—
 18. Spikelets in pairs; racemes two or more:—
 19. Upper glume not awned, or if awned, the awn not more than 3 mm long **Eulalia**
 19. Upper glume awned; awn 7–15 mm long **Pseudopogonatherum**
18. Spikelets in threes, two sessile, one pedicelled **Polytrias**
17. Lower glume convex on the back, at least at maturity:—
 20. Racemes solitary; upper glume awned **Pogonatherum**
20. Racemes two or more:—
 21. Upper glume with a long slender awn; lower glume of sessile spikelet without tufts of hairs; sessile spikelet hermaphrodite **Pseudopogonatherum**
 21. Upper glume with a very short awn; lower glume of fertile spikelet with transversely placed tufts of hairs; sessile spikelet male, the pedicelled hermaphrodite **Lophopogon**
3. Spikelets in each pair dissimilar, the sessile hermaphrodite, the pedicelled male or sterile, or completely absent or if more or less similar then the joints of the raceme and the pedicel thick and swollen:—

22. Joints of the rhachis and pedicel of the pedicelled spikelet (if not much reduced) swollen, 3-angled, rounded or flattened:—
23. Sessile spikelet with a male and a hermaphrodite floret; upper lemma awned, rarely awnless (*Ischaemum inerme*):—
24. Racemes many-noded, not contained in a spathe-like sheath:—
25. Raceme solitary, terminal; lower glume of sessile spikelet not transversely grooved:—
26. Spikelets in pairs, a sessile and a pedicelled forming a false raceme; keel of upper glume with (*Triplopogon*) or without a tuft of hairs:—
27. Lower glume of sessile spikelet when young with two tufts of hair, upper glume with one tuft; ligule membranous **Triplopogon**
27. Lower and upper glumes without tufts of hair; ligule a row of hairs **Sehima**
26. Spikelets solitary, pedicelled, forming a true raceme; the upper glume with a thick tuft of hairs from the middle. **Pogonachne**
25. Racemes two to many; lower glume of sessile spikelet often with nodules on the margins or transversely furrowed:—
28. Pedicelled spikelets developed; lower glume usually coriaceous below, often transversely wrinkled, furrowed or with nodules on the margins **Ischaemum**
28. Pedicelled spikelet reduced to a linear curved pedicel; lower glume coriaceous, convex, covered all over with transverse ridges which are often broken up into warts or teeth, not keeled **Thelepogon**
24. Racemes 1-noded, reduced to three heteromorphous spikelets, enclosed in a boat-shaped spathe **Apluda**
23. Sessile spikelet with a hermaphrodite floret only or occasionally with a male floret below; upper lemma unawned:—
29. Inflorescence of several racemes at the tip of the peduncle:—
30. Lower glume of all spikelets long-tailed with the tail flat; racemes digitate or solitary; aquatic grasses with floating culms **Vossia**
30. Lower glumes not long-tailed:—
31. Lower glume of the pedicelled spikelet keeled, prolonged into an awl-like mucro; rhachis tough or tardily breaking up **Phacelurus**
31. Lower glume of both spikelets not mucronate, unawned; rhachis very fragile **Thysia**
29. Racemes solitary, terminating the culm and branches:—
32. Sessile spikelet spherical; lower glume pitted all over; pedicelled spikelet reduced **Hackelochloa**

32. Sessile spikelet not spherical in shape:—
33. Spikelets similar; rhachis very tough; joints and pedicel fused **Hemarthria**
33. Spikelets more or less dissimilar (spikelets solitary in *Thaumastochloa* and *Ophiuros*); rhachis usually breaking up; joints and pedicels fused or free:—
34. Sessile spikelets surrounded by the joint and pedicel, which form an oblong box-like depression; lower glume broadly winged on each side above, honey-combed with 5-6 vertical rows of deep pits **Ratzeburgia**
34. Sessile spikelets sunk in a recess or depression formed by the joint and pedicel, or in a cavity in the joint:—
35. Sessile spikelet strongly dorsally compressed, sunk in a cavity of the joint; lower glume with a broad wing on each keel, ridged, perforated or sculptured; pedicel and joint fused **Manisuris**
35. Sessile spikelet not winged on the keels of the lower glume; if winged at all, then only at the apex and narrowly:—
36. Lower glume with comb-like spines on the margins of the lower glume, narrowly or not winged at the apex; pedicelled spikelet much reduced **Eremochloa**
36. Lower glume devoid of such spines:—
37. Racemes covered with shaggy hairs:—
38. Lower glumes covered on the margins with bearded warty projections; all the sessile spikelets on one side of the rhachis **Elyonurus**
38. Lower glumes without such warty projections; sessile spikelets alternating at each node of the rhachis; spikelets in threes, one sessile and two pedicelled **Lasiurus**
37. Racemes mostly glabrous, not conspicuously hairy:—
39. Axis of the spikes tough, not breaking up; spikelets paired **Hemarthria**
39. Axis of the spikes fragile:—
40. Sessile spikelets in pairs at each node of the axis **Mnesithea**
40. Sessile spikelets solitary at each node of the axis:—
41. Spikelets paired, one sessile the other pedicelled:—

- 42. Joints (internodes) and pedicels not fused; sessile and pedicelled spikelets present **Coelorhachis**
- 42. Joints and pedicels fused; spikelets of each pair dissimilar, the pedicelled male or neuter; racemes cylindrical, slender:—
 - 43. Spikelets in opposite rows; lower glume of sessile spikelet entire at the tip **Rottboellia**
 - 43. Spikelets dorsiventral; lower glume of sessile spikelet winged at the tip **Heteropholis**
- 41. Spikelets solitary, sessile, the pedicelled suppressed or rudimentary; pedicels fused to the internode (joint):—
 - 43a. Spikes dorsiventral; spikelets secund; lower floret neuter without a palea **Thaumastochloa**
 - 43a. Spikes cylindrical with the spikelets in opposite rows; lower floret usually male with a well-developed palea **Ophiuros**
- 22. Joints of the rhachis and the pedicel narrow, seldom thickened upwards, occasionally with a translucent longitudinal groove; sessile spikelet usually awned:—
 - 44. Inflorescence a terminal raceme:—
 - 45. Lower glume of sessile spikelet when young with two tufts of hair, upper glume with one tuft; ligule membranous **Triplopogon**
 - 45. Lower glume of sessile spikelet without tufts of hair; ligule a row of hairs **Sehima**
 - 44. Inflorescence a panicle:—
 - 46. Spikelets in racemes which are not interrupted by spathes or solitary at the ends of the branches; the racemes collected into whorled panicles; joints and pedicels not furrowed:—
 - 47. Spikelets solitary at the ends of the branches:—
 - 48. Pedicels entirely absent **Cleistachne**
 - 48. Pedicels present; pedicelled spikelets absent **Sorghastrum**
 - 47. Spikelets in pairs or threes; pedicelled spikelets often more or less reduced:—
 - 49. Spikelets dorsally compressed, in panicles of many pairs or in threes of which one is hermaphrodite:—
 - 49a. Racemes up to 30 cm long, tardily disarticulating, with scabrid rhachis-nodes and pedicels; spikelets

- awnless; lower glume 2-keeled for its whole length;
 lodicules glabrous **Hemisorghum**
- 49a. Racemes very much less than 30 cm long, readily
 disarticulating; rhachis-nodes and pedicels ciliate;
 lower glume of sessile spikelet rounded on the sides,
 2-keeled at tip; lodicules hairy **Sorghum**
49. Spikelets compressed from the sides:—
50. Spikelets in groups, each consisting of a sessile and
 two more or less reduced pedicelled spikelets or a
 raceme of several pairs; lower glume smooth, not
 tuberculate **Chrysopogon**
50. Spikelets with many pairs of spikelets arranged in
 whorled racemes; lower glume tuberculate **Vetiveria**
46. Panicles of racemes which are interrupted by spathes, or the
 espatheate racemes digitate or in pairs or solitary and ter-
 minal, sometimes the joints and/or pedicels with a trans-
 lucent median furrow:—
51. Upper lemma of the sessile spikelet with a basal awn;
 sessile spikelet compressed from the side; pedicelled spike-
 let reduced **Arthraxon**
51. Upper lemma of the sessile spikelet awned from the tip or
 from the cleft or upper lemma reduced to the hyaline
 base of the awn, very rarely unawned:—
52. Margins of the lower glume of the sessile spikelets
 sharply infolded, 2-keeled; awn glabrous:—
53. Upper lemma of the sessile spikelet not cleft, often
 stipitate and passing into the awn (except *Pseudo-*
sorghum):—
54. Spikelets arranged in false racemes terminating the
 branches and branchlets of a true panicle; pedicels
 with a median translucent furrow (except *Capilli-*
pedium venustum) **Capillipedium**
54. Spikelets arranged in false racemes which are either
 solitary and terminal or subsessile, arranged along
 a central axis but not at the tips of capillary
 branches:—
55. Racemes solitary at the ends of the branches
 supported by spathes, but sessile spikelets not
 overlapping:—
56. Racemes with two fertile spikelets; lower
 glumes not pitted **Pseudanthistiria**
56. Racemes with many fertile spikelets; lower
 glumes pitted or not **Eremopogon**
55. Racemes several to many, if solitary then the
 sessile spikelets imbricate:—

57. Joints and pedicel with a translucent longitudinal furrow:—
58. All pairs of spikelets heterogamous, rarely one pair homogamous; racemes ascending; glumes sometimes pitted **Bothriochloa** //
58. The lower 1–3 pairs of spikelets homogamous; racemes nodding; glumes never pitted **Euclasta**
57. Joints and pedicels without a translucent furrow:—
59. All pairs of spikelets heterogamous; upper lemma of sessile spikelets bifid **Pseudosorghum**
59. Lowest 1–3 pairs of spikelets homogamous; upper lemma of sessile spikelet reduced to the translucent base of an awn:—
60. All spikelets, both sessile and pedicelled, in the racemes more or less alike; glumes herbaceous, greenish **Dichanthium** //
60. Lower 1–3 spikelets homomorphous, the remainder heteromorphous; lower glumes of the sessile hermaphrodite spikelets chartaceous, white; glumes of lower homogamous spikelets and those of pedicelled spikelet turning red **Indochloa**
53. Upper lemma of the sessile spikelet 2-lobed or 2-cleft, awned in the sinus:—
61. Aromatic grasses*; racemes in pairs supported by spathes, often collected into huge panicles; one pair of spikelets in each raceme homogamous, male or neuter, all other pairs heterogamous **Cymbopogon**
61. Grasses not aromatic*; racemes in pairs, or digitate or solitary:—
62. Racemes solitary at the end of the culms and their branches; joints and pedicels often somewhat stout; pedicelled spikelets male, neuter or suppressed:—
63. Pedicelled spikelets very much larger than the sessile; upper glume awned; joints and pedicels bucciniform **Diectomis**
63. Pedicelled spikelets not conspicuously larger, often small to very small; upper glume awnless; joints and pedicels clavate, 2-toothed **Schizachyrium**

* If a leaf is chewed the aromatic oils are noticeable at once.

62. Racemes 2-nate or more rarely digitate, usually all pairs of spikelets heterogamous and all sessile spikelets hermaphrodite and alike or the lowest more or less reduced and barren, but still resembling the upper fertile spikelets

Andropogon ✓

52. Margins of the lower glumes inturned and rounded at the sides, at the most keeled upwards; callus mostly sharp and long; awn usually hairy:—

64. Upper lemma 2-lobed or 2-cleft and awned from the sinus:—

65. Inflorescence a panicle of many raceme-pairs supported by spathes; awn hairy; upper glume acute

Hyparrhenia

65. Inflorescence of two racemes only; awn not hairy; upper glume 2-lobed and awned from the depression between them

Bhidea

64. Upper lemma not 2-lobed or cleft, stipitate and passing into the awn:—

66. Racemes solitary at the ends of the branches, surrounded at the base by an involucre of homogamous spikelets:—

67. Involucre of four 1-flowered or sterile spikelets:—

68. Involucral spikelets pedicellate, deciduous; callus of fertile spikelets very short, truncate or obtuse

Iseilema ✓

68. Involucral spikelets sessile, not deciduous; callus of the fertile spikelets pointed

Themeda

67. Involucre of 6–9 2-flowered male spikelets

Germainia

66. Racemes without an involucre:—

69. Racemes straight or very slightly curved; glumes often garnished with tubercle-based bristles; lower glume of sessile spikelet terete, grooved or not on the back, usually covered with short hairs

Heteropogon

69. Racemes markedly curved; glumes glabrous; lower glume of the sessile spikelet keeled and broadly winged, glabrous **Pseudodichanthium**

Andropogon Linn., Gen. Pl. ed. 5, 468 (1754) et in Sp. Pl. ed. 1, 1045 (1753).

Key to the species and varieties of *Andropogon*

1. Inflorescence of 2 or more racemes, digitate not truly paniced:—
 2. Lower glume of the sessile spikelet concave, strongly compressed so that the margins almost meet in the middle line (confined to one species with several racemes up to 10 cm long and another with two divergent racemes seated on cuneate 4-toothed stipes):—
 3. Racemes numerous, 10 cm long, with golden hairs; a robust grass, perennial *A. burmanicus*
 3. Raceme binate, about 2 cm long, deciduous from the 4-toothed cuneate basal stipes, not hairy *A. pumilus*
 2. Lower glume of the sessile spikelet shallowly concave, flat or slightly convex or with a slit-like groove:—
 4. Joints and pedicels slender, slightly dilated at the top:—
 5. Racemes not conspicuously villous:—
 6. Lower glume without a slit-like groove:—
 7. Upper cup of the joints denticulate or with an appendage:—
 8. Racemes most often more than 2; lower glume of sessile spikelet 5–5.5 mm long, 0.75–1 mm broad, shallowly or deeply grooved from base to just below apex; upper glume not winged *A. tristis*
 8. Racemes almost invariably 2; lower glume of sessile spikelet 7–8 mm long, 1.25–1.5 mm broad, shallowly or deeply concave in lower half; upper glume winged, sometimes shortly awned *A. lividus*
 7. Upper cup of the joints without teeth or appendages:—
 - 8a. Leaves flat; racemes several; peduncle below inflorescence glabrous; awn 1.5 cm long *A. polytychus* var. *polytychus*
 - 8a. Leaves filiform; racemes 1 or 2; peduncle hairy below inflorescence; awn over 2 cm long *A. polytychus* var. *deccanensis*
 5. Racemes conspicuously villous *A. gayanus*
 4. Joints definitely thickened upwards, from clavate to bucciniform:—
 9. Racemes not conspicuously villous; no creeping rhizomes:—
 10. Lower glume of sessile spikelet deeply grooved along the back, 4–5 mm long; keels not winged; joints and pedicels bucciniform; awn of sessile spikelet 1.5–2.5 cm long *A. ascinodis*
 10. Lower glume of the sessile spikelet almost flat or slightly concave, conspicuously nerved, 5.5–7.5 mm long, broadly winged on the keels; joints and pedicels clavate; awn of sessile spikelet just over 1 cm long *A. longipes*

9. Racemes conspicuously villous; creeping rhizomes present

A. hallii

1. Inflorescence of 4–8 racemes on the short branches of a panicle; racemes eventually divergent from one another; upper glume not awned; sessile spikelets 4–5 mm long

A. munroi

1. **Andropogon ascinodis** C. B. Clarke in J. Linn. Soc. (Bot.) 25, 87 (1889) t. 36.

A. apricus var. *indicus* Hack. in DC., Monogr. Phan. 6, 457 (1889).

A. apricus of the Fl. Brit. Ind. 7, 169 (1896) non Trin. (1836).

Distribution: Eastern India in hill districts—Bihar, Burma, Manipur, Madras.

This grass is often gregarious over large stretches of hillside in the hills of Assam. It is eaten by cattle and mithan.

Exsicc.—Hook f. et T. Thoms. s.n., Khasia; N. L. Bor 18005, Manipur

2. **Andropogon burmanicus** Bor in Appendix p. 688.

Distribution: Burma (Pegu).

This species has been collected on one occasion only.

Exsicc.—U Thein Lwin s.n., Pegu, Burma.

3. **Andropogon gayanus** Kunth, Enum. Pl. 1, 491 (1833).

A. guineensis Steud., Syn. Pl. Glum. 1, 371 (1854).

A. tomentellus Steud., loc. cit. 371.

A. reconditus Steud., loc. cit. 386.

Distribution: Tropical Africa.

This grass has been introduced into India, where it is reported to be drought resistant and not susceptible to frost. It is a leafy species and should provide good fodder. $2n = 40$.

A number of varieties of this species have been described by Stapf. As they are well-marked and may occur in the introduced material, they may be separated by the following key.

1. Pedicelled spikelets glabrous; joints and pedicels ciliate on one margin only
A. gayanus var. *gayanus*
1. Pedicelled spikelets scaberulous or villous to puberulous; joints and pedicels hairy on both margins, or on one margin only:—
 2. Pedicelled spikelets scaberulous; joints and pedicels ciliate on both margins
A. gayanus var. *squamulatus*
 2. Pedicelled spikelets hairy:—
 3. Pedicelled spikelets plumosely villous; basal leaves villous
A. gayanus var. *argyrophoeus*
 3. Pedicelled spikelets not so hairy; basal leaves not villous
A. gayanus var. *bisquamulatus*

In Africa this grass grows in large tufts up to 2 m in height. The young shoots are preferred but cattle will eat it up to the time of flowering. The stems when flattened are used for coarse matting.

4. **Andropogon hallii** Hack. in Sitzb. Akad. Wiss. Math. Nat. Wien 89, 127 (1884).

Apocopis Nees in Proc. Linn. Soc. Lond. 1, 93 (1841).
Amblyachyrum Hochst. ex Steud., Syn. Pl. Glum. 1, 413 (1855).

Key to the species of *Apocopis*

1. Annuals:—

2. One or more nerves reaching the upper margin of the lower glume:—
 3. Peduncle hirsute below the panicle; nerves very conspicuous as scabrid ridges on the dorsal surface of the lower glume which is 4–4.5 mm long, 1.25–1.8 cm wide *A. siamensis*
 3. Peduncle glabrous below the panicle; nerves of glumes faint or at least the dorsal surface of the glume not ridged:—
 4. Median nerve and at least 2 others reaching the upper denticulate margin of the lower glume, but all close to it; lower glume 3–4 mm long, 2 mm wide, oblong-truncate in shape, glabrous and shining or hirsute; awn 1.8 cm long *A. burmanica*
 4. Median nerve alone reaching the upper margin of the lower glume in a notch or shallow depression and produced as a small point, or all ending below the red-banded upper margin; awn over 2 cm long:—
 5. Lower glume 3–3.5 mm long, 1.25 mm wide, elliptic-oblong-truncate in shape with a reddish band at the top; awn 2.5 cm long *A. cochinchinensis*
 5. Lower glume 5.5 mm long, 4 mm broad, obcordate-oblong in shape with a narrow hyaline band at the top; awn 4 cm long *A. pulcherrima*
2. All nerves ending below the upper margin of the glume; no red band at the top:—
 6. Inflorescence concealed within the uppermost leaf-sheath; anthers about 1 mm long *A. vaginata*
 6. Inflorescence well exerted; anthers 2–2.25 mm long *A. mangalorensis*

1. Perennials:—

7. Pedicelled spikelets reduced to the pedicel:—

8. Base of the plants not woolly:—

9. Outer pair of nerves on both sides anastomosing and produced beyond the upper margin of the lower glume as two points; spikelets usually unawned but occasionally awned; lower glume 4.5 mm long, 2.25 mm wide *A. paleacea*

9. Lower glume not as above:—

10. Lower glume about 6 mm long and over, chocolate in colour; spikelets awned *A. peguensis*

10. Lower glume obcordate, 4.5–5 mm long, 3 mm broad at widest point; centre nerve and/or side nerve or nerves excurrent or closer to the upper margin than the others *A. courtallumensis*

8. Base of the plant covered with a dense pale yellow wool

A. floccosa

7. Pedicelled spikelets present

*A. anomala*1. **Apocopis anomala** Bor in Kew Bull. 1957, 415 (1958).

Distribution: Burma.

Exsicc.—Mindat, *Kingdon-Ward* 22155.2. **Apocopis burmanica** Narayanaswami ex Bor in Kew Bull. 1951, 169 (1951).

Distribution: Burma.

This is a species found in waste places and is probably browsed by cattle.

Exsicc.—*Kurz* 2749, Burma.3. **Apocopis cochinchinensis** A. Camus in Bull. Mus. Hist. Nat., Paris, 25, 286 (1919).

Distribution: Burma and South-east Asia.

The red band at the top of the lower glume is characteristic of this species.

Exsicc.—*U Thein Lwin* 391, Burma.3. **Apocopis courtallumensis** (Steud.) Henr. in Blumea 4, 524 (1941).*Andropogon courtallumensis* Steud., Syn. Pl. Glum. 1, 377 (1854).*Apocopis wightii* Nees ex Thwaites, Enum. Pl. Zeyl. 365 (1864).

Distribution: Madras State and Ceylon.

Little is known of this grass as fodder.

Exsicc.—*Wight* 2352, Madras.4. **Apocopis floccosa** Bor in Kew Bull. 1957, 414 (1958).

Distribution: Burma.

There is only one collection of this interesting species, but the collector states that it is fairly common on rocky hillsides near Taunggyi in the Southern Shan States at an altitude of about 1400 m.

Exsicc.—*U Thein Lwin* 531, Burma (K).

- ✓ 5. *Apocopis mangalorensis* (Hochst.) Henr. in Blumea 4, 523 (1941).
Amblyachyrum mangalorens Hochst. in Flora 39, 26 (1856).
 Distribution: Seems to be confined to Madras, Bombay and Ceylon.
 Forms part of the adventitious pasture that springs up in waste places.
 Exsicc.—Madras Herb. 16286 (K).

6. *Apocopis paleacea* (Trin.) Hochr. in Bull. N.Y. Bot. Gdn. 6, 262 (1910).
Ischaemum paleaceum Trin. in Mém. Acad. Sci. Pétersb., sér. 6, 2, 293 (1832).

- Apocopis royleana* Nees in Ann. Mag. Nat. Hist. 7, 142 (1841).
Andropogon paleaceus (Trin.) Steud., Syn. Pl. Glum. 1, 376 (1854).
A. himalayensis Steud., loc. cit. 377.
Apocopis himalayensis (Steud.) W. Watson in Atkins., Gaz. N.W. India, 392 (1882).

Distribution: With the exception of Ceylon, Madras and Bombay States, this grass is found in the rest of India. It extends into Malaysia and Siam.

It forms part of the sward on open hillsides in Assam, and with other grasses is grazed by cattle.

Exsicc.—Royle 357, north-west India; N. L. Bor 17988, Khasia; G. Watt 6827, Manipur.

7. *Apocopis peguensis* Bor in Kew Bull. 1949, 28 (1949).

Distribution: Burma.

This grass has only been collected once and its fodder potentialities are not known.

Exsicc.—U Thein Lwin 59, Burma.

8. *Apocopis pulcherrima* Bor in Kew Bull. 1951, 168 (1951).

Distribution: Burma.

A very distinctive species which does not appear to be very common.
 Exsicc.—Rhind 959, Burma.

9. *Apocopis siamensis* A. Camus in Lecomte, Not. Syst. 3, 83 (1914).

Distribution: Siam, but almost certainly also in Burma.

Nothing is known about its value as fodder.

- ✓ 10. *Apocopis vaginata* Hack. in Öst. Bot. Z. 41, 8 (1891).

Distribution: Madhya Pradesh, Uttar Pradesh, Bihar and Madras.

This small species seems to be very common and gregarious in open pasture and forest clearings. It has, therefore, some value as fodder, but it is not known if cattle are particularly partial to it.

Exsicc.—C. B. Clarke 33849, Hazaribagh.

Arthraxon P. Beauv., Essai Agrost. 111 (1812) t. 11, fig. 6.
Pleuroplitis Trin., Fund. Agrost. 174 (1820).
Lucaea Kunth, Rev. Gram. 2, 489 (1831) t. 139.

Bathratherum Nees in Edinb. New Phil. J. **18**, 180 (1835).

Lasiolytrum Steud. in Flora **29**, 18 (1846).

Alectoridia A. Rich., Tent. Fl. Abyss. **2**, 447 (1851).

Psilopogon Hochst. ex A. Rich. loc. cit. 447.

Key to the species of *Arthraxon*

1. Spikelets long-awned; awn 15–25 cm long *A. jubatus*
1. Spikelets short-awned or awnless; awn not more than 2.5 cm long:—
 2. Spikelets awnless *A. submuticus*
 2. Spikelets awned:—
 3. Lower glume of sessile spikelet densely villous; keels with narrow densely ciliate wings *A. villosus*
 3. Lower glumes of sessile spikelets not densely villous, at most puberulous:—
 4. Lower glumes of sessile spikelets rounded on the back, not keeled; spikelets laterally compressed:—
 5. Pedicelled spikelets, at least in the upper part of the raceme, developed:—
 6. Spikelets 2.5–3.5 mm long:—
 7. Racemes usually 5–10, silky-silvery; stamens 2; anthers 0.5 mm long; peduncles puberulous; spikelets 2.5–3 mm long *A. lancifolius*
 7. Racemes 2–3; lower glume strongly ribbed on the dorsal surface; peduncles glabrous; spikelets 3.5 mm long *A. sikkimensis*
 6. Spikelets 5–6.5 mm long, muriculate at tip of glumes *A. hookeri*
 5. Pedicelled spikelets not developed; pedicels more or less reduced:—
 8. Stamens 2:—
 9. Pedicel and joints long ciliate:—
 10. Spikelets 4 mm long *A. micans*
 10. Spikelets 7–7.5 mm long *A. santapaui*
 9. Pedicel glabrous or subglabrous; joints glabrous or ciliate:—
 11. Pedicel reduced to a minute glabrous point; joints sparingly ciliate, 1.75–2 mm long; spikelets 3–4 mm long; upper glume puberulous at the apex *A. quartinianus*
 11. Pedicel one-half to three-quarters the length of the sessile spikelet; joints sub-glabrous, 3–5 mm long; upper glume hispid at the apex or muriculate *A. hispidus*
 8. Stamens 3:—
 12. Anthers 0.5 mm or less long; spikelets 3–4 mm long:—
 13. Pedicel 1.5–2 mm long, very slender *A. nudus*

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13. Pedicel a minute glabrous point *A. quartinianus*
 12. Anthers over 1.5 mm long; spikelets 2.5–8 mm long:—
 14. Spikelets 6–8 mm long; anthers 3.5 mm long; peduncles puberulous; lower and upper glume almost crustaceous in texture with a few stout tubercles at the tip of the lower glume, brown in colour
A. castratus
 14. Spikelets not over 5 mm; glumes not crustaceous:—
 15. Pedicels absent or microscopic; anthers 1.5 mm long or more (2.5); spikelets 2.5–3 mm long; awn 7–8 mm long
A. inermis
 15. Pedicels up to 2 mm long:—
 16. Joints and pedicels ciliate; spikelets 4 mm long, rather plump; anthers 2 mm long *A. nitidulus*
 16. Joints and pedicels glabrous or subglabrous; spikelets 4–5 mm long; racemes many; anthers 3, 1.5 mm long *A. breviaristatus*
 4. Lower glume of sessile spikelet 2-keeled, sometimes almost flat on the back; spikelets not laterally compressed:—
 17. Keels of lower glume of sessile spikelet tubercled or toothed; pedicelled spikelets more or less developed:—
 18. Lower glume of sessile spikelets 5–7 mm or less long with pectinately toothed keels; hooks or tubercles not penicillate upward; joints of rhachis 2.5–3 mm long:—
 19. Lower glume of sessile spikelets 4.5–5 mm long with pectinately toothed, spinulose or tubercled keels; base covered with silky cataphylls:—
 20. Lower glume flat on the back or slightly convex with strongly marked nerves, pectinate on the keels from base to apex but not muricate on the intermediate nerves *A. lanceolatus*
 20. Lower glume rounded on the back, often cylindrical but keeled, pectinate on the keels and often muricate on the intermediate nerves as well near the tip
A. prionodes
 19. Lower glume of sessile spikelets 5 mm long; nerves on back echinulate, rarely the lower smooth; rootstock and sheath not tomentose *A. echinatus*
 18. Lower glume of sessile spikelet narrowly linear-lanceolate, 7 mm long; keels with a double row of tubercles, gradually becoming spinulose towards the apex; upper tubercles penicillate:—
 21. Stamens 3, c.3 mm long *A. meeboldii*
 21. Stamens 2 or 3, 1.5 mm long *A. purandharensis*
 17. Lower glume of sessile spikelets linear-lanceolate, subcoriaceous, 5–6.5 mm long; keels spinulose-hispid *A. depressus*

Andropogon submuticus Nees ex Steud., Syn. Pl. Glum. 1, 382 (1854).

Distribution: Himalaya from Nepal westwards.

Little is known of this grass—it is found in the hills between 500 and 2000 m.

Exsicc.—Wallich 8836, Nepal.

- ✓ 21. **Arthraxon villosus** C. E. C. Fischer in Kew Bull. 1933, 350 (1933).
Distribution: Western Ghats.

One collector states that this grass “is common along the wayside”. C. E. C. Fischer based his species on an incomplete specimen, and states that the “roots were not seen”. P. V. Bole collected the same species at Ludwig Point, Mahabaleshwar, and this specimen shows that the grass is an annual.

Exsicc.—Bourne s.n., Madras.

Bhidea Stapf ex Bor in Kew Bull. 1948, 445 (1949).

- ✓ 1. **Bhidea burnsiana** Bor, in Kew Bull. 1948, 445 (1949).

Distribution: Endemic in Bombay State.

Apparently a rare annual on dry habitats. It is found gregarious as a pioneer on cleared patches of ground or in abandoned fields.

Exsicc.—Type at Kew (*Bhide* s.n., Lonavla, Bombay); R. R. Fernandez 1579, Borivli, Bombay.

Bothriochloa O. Ktze., Rev. Gen. Pl. 2, 762 (1891).

Amphilophis Nash in Britton, Man. Fl. North. Unit. Stat. 71 (1901).

Key to the species of *Bothriochloa*

1. Lower racemes longer than the rhachis:—
 2. Lower glumes of the sessile spikelets hairy below the middle:—
 3. Very robust; sheaths long, covering the internodes, markedly compressed; leaves green, broad, long; panicle very large up to 14 cm long, 5 cm broad, very pale; upper glume of sessile spikelet mucronulate or shortly awned; plant aromatic *B. compressa*
 3. Above characters not found together; upper glume of the sessile spikelet obtuse not awned:—
 4. Lower glume of the sessile spikelet with one, rarely two pits:—
 5. Racemes many, 9–15 in number, up to 8 cm long; leaves mostly cauline *B. kuntzeana*
 5. Racemes few, 2–8, up to 5 cm long; leaves mostly at the base *B. pertusa*
 4. Lower glume of the sessile spikelets without pits:—

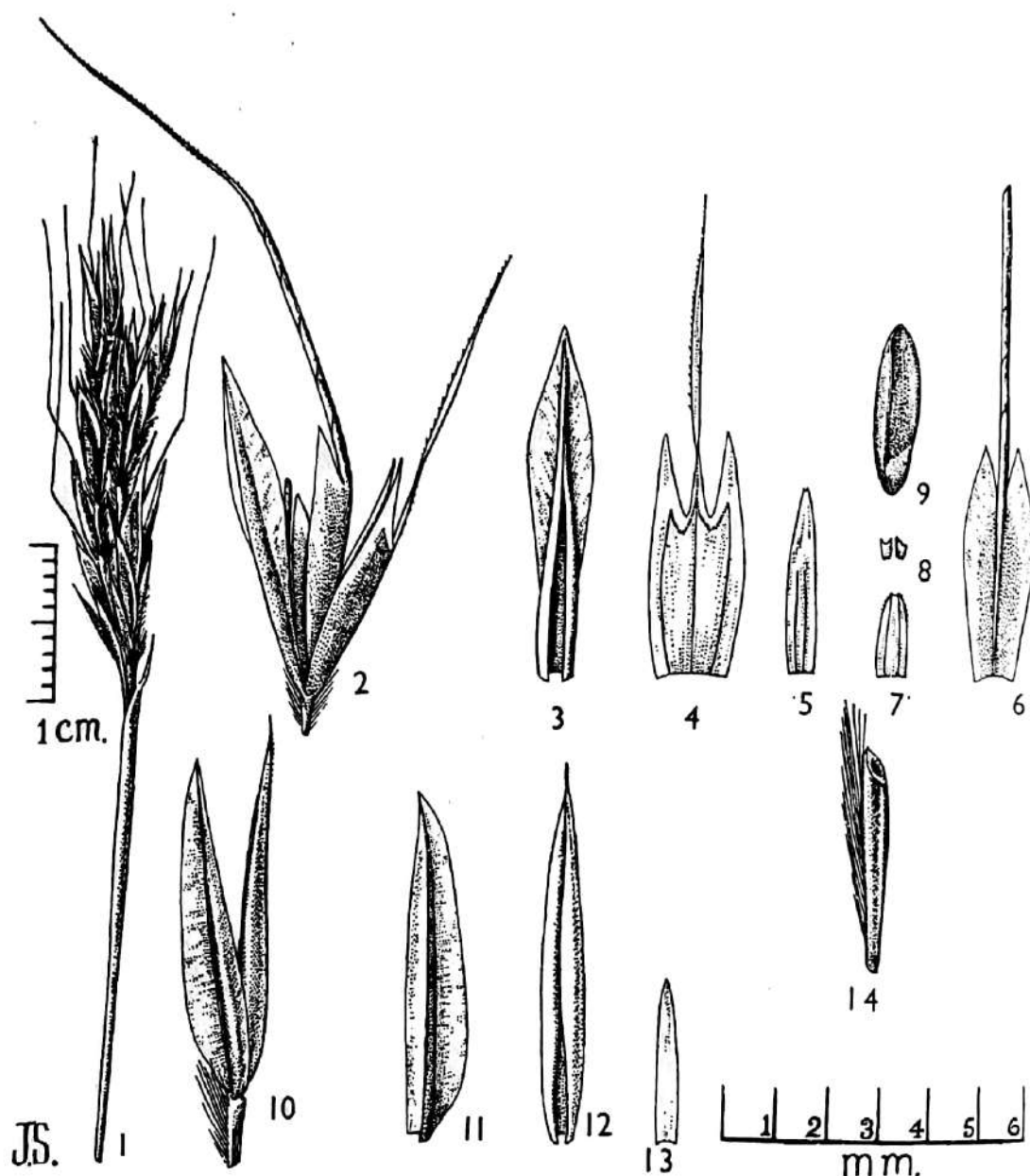


Fig. 2. *Bhidea burnsiana* Bor

1, Inflorescence; 2, sessile spikelet; 3, lower glume; 4, upper glume; 5, lower lemma; 6, upper lemma; 7, palea of upper lemma; 8, lodicules; 9, grain; 10, pedicelled spikelet; 11, lower glume; 12, upper glume; 13, lemma; 14, joint of the raceme.

6. Leaves markedly pruinose on the under surface; leaf-sheaths terete:—
 7. Spikelets 4–4.5 mm long, elliptic-acute; racemes up to 6 cm long
B. pseudoischaemum
 7. Spikelets 4.5–5.5 mm long, elliptic-acuminate; racemes up to 10 cm long, flexuous
B. oryzetorum
6. Leaves green; sheaths keeled:—
 8. Stems much branched; sheaths very inflated
B. grahamii
 8. Stems not excessively branched; sheaths not inflated:—
 9. Racemes up to 8 cm long, 9–15 in number, silky; sessile spikelets 5 mm long
B. kuntzeana
 9. Racemes up to 5 cm long, 2–7 in number; sessile spikelets 4.5–5 mm long:—
 10. Leaves mainly congregated at the base of the stem; stems slender; nodes naked or bearded; lower glumes of sessile spikelet 5–7-nerved, unpitted, with short woolly hairs in the lower three-quarters; leaf-sheaths keeled
B. ischaemum
 10. Leaves cauline, not mainly collected below; stems tall and robust, compressed, 2-angled; leaf-sheaths keeled; nodes glabrous; lower glumes of sessile spikelets 8–12-nerved; plant smelling of camphor (Woodrow)
B. woodrowii
2. Lower glume of sessile spikelet glabrous:—
 11. Leaves distichous, ensiform, flat, up to 20 cm long, 12 mm wide; sheaths strongly compressed; sessile spikelets 2.5–5 mm long
B. ensiformis
 11. Leaves not distichous or broad or ensiform, at most 5 mm wide:—
 12. Lower glume of sessile spikelet not pitted:—
 13. Lower glume of pedicelled spikelet pitted; pit slit-like; sessile spikelet 4.5–5 mm long; nodes very hairy
B. kuntzeana
 13. Lower glume of pedicelled spikelet not pitted; nodes glabrous:—
 14. Sessile spikelets 3–3.5 mm long; leaves mainly cauline; pedicels of the pedicelled spikelet without a translucent middle line
B. concanensis
 14. Sessile spikelets 4 mm long; leaves mainly basal; pedicels with a translucent middle line, or the pedicels channelled but not translucent
B. foulkesii
 12. Lower glume of sessile spikelet pitted:—
 15. Lower glume of pedicelled spikelet pitted; lower glume of sessile spikelet membranous to chartaceous:—
 16. Lower glume of pedicelled spikelet with 2–4 pits or glandular depressions; sessile spikelet 4.5 mm long
B. insculpta

16. Lower glume of pedicelled spikelet with 1 slit-like pit; sessile spikelet 4.5–5 mm long *B. kuntzeana*
15. Lower glume of pedicelled spikelet not pitted; lower glumes of sessile spikelet coriaceous *B. longifolia*
1. Lower racemes shorter than the rhachis:—
17. Panicle very aromatic; racemes silky *B. odorata*
17. Panicle not aromatic; racemes not very silky:—
18. Lower lemma of the sessile spikelet about half the length of the lower glume; spikelets 3–3.5 mm long; lower glume not pitted *B. caucasica*
18. Lower lemma of the sessile spikelet nearly as long as the glume; spikelets 4 mm long or longer:—
19. Primary axis of the panicle mostly 3–7 (rarely 2 or up to 10) cm long; all branches of the panicle simple, rarely one of the lower divided; racemes 3–7 cm long; sessile spikelets 3.5–4.5 mm long *B. intermedia*
20. Sessile spikelets not pitted var. *intermedia*
20. Sessile spikelets pitted var. *punctata*
19. Primary axis of the panicle 5–10 cm long; branches more or less divided, or if undivided very fine and naked up to over 1.5 cm from the base; racemes 2–5 cm long; sessile spikelet pitted or non-pitted; rather coarse grasses with blades 4–10 mm broad *B. glabra*

1. ***Bothriochloa caucasica* (Trin.) C. E. Hubb.** in Kew Bull. 1939, 101 (1939).

Andropogon causicus Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 286 (1832).

Sorghum causicum (Trin.) Griseb. in Ledeb., Fl. Ross. 4, 476 (1853).

Andropogon intermedius var. *caucasica* (Trin.) Hack. in DC., Monogr. Phan. 6, 486 (1889).

Distribution: North-west India and southern Russia, introduced into America.

A very promising fodder grass and perhaps the hardiest in the genus.
 $2n = 40$.

Exsicc.—*J. F. Duthie* 7597, Agror Valley.

- ✓ 2. ***Bothriochloa compressa* (Hook. f.) Henr.** in Blumea 3, 456 (1940).
Andropogon compressus Hook. f., Fl. Brit. Ind. 7, 172 (1896).

Distribution: Deccan.

This very striking plant, with long broad leaves and sharply keeled sheaths, has, strange to relate, been collected on two occasions only. It is said to be aromatic.

Exsicc.—*Lisboa* s.n., Deccan.

- ✓ 3. ***Bothriochloa concanensis* (Hook. f.) Henr.** in Blumea 3, 457 (1940).
Andropogon concanensis Hook. f., Fl. Brit. Ind. 7, 174 (1896).

Andropogon pseudoischaemum Nees ex Steud., Syn. Pl. Glum. 1, 380 (1854).

Distribution: Madras State, Ceylon.

Little is known of this grass, but it is probably commoner than the collections would lead one to conclude.

Exsicc.—Wallich 8815 A. Madras; J. S. Gamble 27157, Madras.

- ✓ 17. ***Bothriochloa woodrowii*** (Hook. f.) A. Camus in Ann. Soc. Linn. Lyon, 1930, n.s. 76, 165 (1931).

Andropogon woodrowii Hook. f., Fl. Brit. Ind. 7, 173 (1896).

Amphilophis woodrowii (Hook. f.) A. Camus in Rev. Bot. Appl. 305 (1921).

Distribution: Bombay, Mawal, Pand, so far endemic.

Woodrow collected this species in 1891 at Khorbasa, Mawal and at Pand, and so far as the writer knows it has not been collected since. There are five sheets of this same gathering in the Kew Herbarium, so that it cannot have been uncommon in these two places. According to Woodrow it smells of camphor.

Exsicc.—Woodrow s.n., Bombay.

Capillipedium Stapf in Prain, Fl. Trop. Afr. 9, 169 (1917).

Key to the species of *Capillipedium*

1. Pedicels opaque, without a translucent median furrow *C. venustum*
1. Pedicels with a definite translucent median furrow:—
 2. Pedicels terete or compressed, not conspicuously flattened:—
 3. Culms weak, decumbent and trailing, much geniculately branched *C. filiculme*
 3. Culms erect, robust, simple or branched:—
 4. Peduncles of the racemes ciliate *C. pteropechys*
 4. Peduncles of the racemes glabrous:—
 5. Lower glume of the sessile spikelet channelled; leaves slightly narrowed or rounded at the base; panicle large, diffuse, of small spikelets *C. parviflorum*
 5. Lower glume of the sessile spikelet flat on the back; leaves conspicuously narrowed at the base; panicle often dense, of many or few spikelets:—
 6. Nodes glabrous or shortly hairy; callus shortly bearded; panicle often somewhat open *C. assimile*
 6. Nodes densely bearded; callus villously bearded; panicles contracted *C. huegelii*
 2. Pedicels flat, almost spathulate; pedicelled spikelets much reduced *C. planipedicellatum*

✓ 1. ***Capillipedium assimile*** (Steud.) A. Camus in Lecomte, Fl. Gén. de l'Indo-Chine 7, 314 (1922).

it is better left in *Capillipedium* where it represents a very reduced form. Exsicc.—N. L. Bor 17059, Manipur (Type K).

6. ***Capillipedium pteropechys* (Clarke) Stapf** in Hook., Ic. Pl. (1922) sub tab. 3085.

Andropogon pteropechys Clarke in J. Linn. Soc. (Bot.) 25, 88 (1899) t. 38. Distribution: Seems to be endemic in the Naga Hills.

A rather uncommon species found on the central range of the Naga Hills and its outliers to the east.

Exsicc.—N. L. Bor 6712, Naga Hills.

7. ***Capillipedium venustum* (Thw.) Bor**, comb. nov.

Andropogon venustus Thw., Enum. Pl. Zeyl. 367 (1864).

Bothriochloa venusta (Thw.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 76, 165 (1931).

Vetiveria venusta (Thw.) Willis, Rev. Cat. Pl. Ceyl. no. 2713 (1911).

Distribution: Ceylon, Madras, above the 1700 m contour.

Exsicc.—Thwaites C.P. 2875, Ceylon; F. Ballard 1134, 1264, Ceylon.

This species has given much trouble to harassed taxonomists and its presence in *Andropogon*, *Vetiveria*, *Bothriochloa* and now *Capillipedium* is a clear indication of the uncertainty of its affinities. While its inclusion in *Capillipedium* cannot be said to be altogether satisfactory, some remarks about its position in other genera may be pertinent.

It seems to be out of place in *Bothriochloa*, from which it differs in the structure of the racemes making up the panicle and having solid pedicels instead of those with a translucent channel. The racemes in *Vetiveria* again are quite different and indeed the only resemblance between the two is the unchannelled pedicel. It agrees with *Capillipedium* in appearance, in the shape of the spikelets and in their grouping at the ends of filiform branches and in the bearded articulations of the joints and pedicels. Actually the only character by which it could be separated from *Capillipedium* is the non-channelled pedicel.

Anyone who has had ripe experience in naming Indian grasses will instinctively place it in *Capillipedium*, and although this feeling, flair or instinct, call it what you will, will be lightly dismissed by some, I consider that there is a great deal of substance in it. The correct position of this grass is just another of those problems which will not be solved until a detailed cyto-genetical investigation is made.

***Chrysopogon* Trin.**, Fund. Agrost. 187 (1820); nomen genericum conservandum.

Rhaphis Lour., Fl. Cochinch. 552 (1790).

Centrophorum Trin., Fund. Agrost. 106 (1820).

Pollinia Spreng., Pugill. 2, 10 (1815) in part.

Key to the species of *Chrysopogon*

1. Pedicels half the length of the sessile spikelets or longer:—
2. Pedicels glabrous or nearly so:—

3. Base of plant creeping; sessile spikelets 3-4.5 mm long, with a very long (as long as the spikelet) pungent callus decurrent on the peduncle
C. aciculatus
3. Culms erect, not creeping at base; sessile spikelets 5-8 mm long, without a decurrent callus:—
4. Panicle large, lax, 18-30 cm long, 6-10 cm wide; awns 25-35 mm long
C. gryllus
4. Panicle contracted, 6-18 cm long, 3 cm wide; awns 12-18 mm long
C. echinulatus
2. Pedicels villous with rusty or pale hairs:—
5. Lower glume of the pedicelled spikelet with a long awn; upper glume not or very shortly awned:—
6. Leaves conspicuously distichous, often plicate; sheaths much compressed below, acutely keeled, often beset with bristles from bulbous bases; leaf-base semi-amplexicaul
C. asper
6. Leaves not conspicuously distichous; sheaths rounded on the back:—
7. Leaves linear, up to 45 cm long, 20 mm wide, hairy with long (caducous) white hairs and much smaller hairs, spinulose-scabrid on the margins; panicle branches straight, verticillate
C. verticillatus
7. Leaves long, quite glabrous, up to 30 cm long, 1 cm broad:—
8. Pedicelled spikelet over 1 cm long; sessile spikelet glabrous; panicle very dense; lower branches twice as long as panicle-internodes; leaves scaberulous below
C. hamiltonii
8. Pedicelled spikelet less than 1 cm long; sessile spikelet hispid above middle on back and sides; panicle dense; branches not twice as long as panicle-internodes; leaves smooth above and below
C. lancearius
5. Lower and upper glumes of pedicelled spikelet both awned:—
9. Leaves mostly collected at the base of the plant, linear, contracted abruptly to a rather blunt tip, spinulose on the margins; sheaths sharply keeled; pedicelled spikelets usually hairy; lower glume of sessile spikelet hispid at the tip; hairs on awn white, about 1 mm long; awn 65 mm long
C. orientalis
9. Leaves mostly cauline, linear-acuminate, smooth on the margins; sheaths not sharply keeled; pedicelled spikelets glabrous; lower glume of sessile spikelet not hispid at apex; hairs less than 0.5 mm long; awn up to 40 mm long
C. distichophyllus
5. Lower glume of pedicelled spikelet not awned; upper glume not or shortly aristate; sessile spikelet 6-6.5 mm long; lower sheaths sharply keeled
C. zeylanicus
1. Pedicels shorter than half the length of the sessile spikelet:—
10. Leaves glabrous, occasionally with a few tubercle-based hairs, not puberulous:—

11. Leaves conspicuously distichous; panicle narrow, 12 cm long, 2.5 cm wide, interrupted *C. polyphyllus*
11. Leaves not distichous:—
12. Pedicelled spikelets definitely shorter than the sessile; hairs chocolate-brown or rufous-brown; lower glume of pedicelled spikelet not awned *C. hackelii*
12. Pedicelled spikelets a little shorter than, equal to, or longer than the sessile; hairs golden or golden-brown or if rufous-brown then lower glume of pedicelled spikelet awned:—
13. Upper glume of the sessile spikelet keeled, pectinate-ciliate in the lower two-thirds or three-quarters with long golden or golden-brown rigid hairs; lower glume of pedicelled spikelet pubescent and awned (or glabrous and not awned?); sessile spikelets 4–6 mm long; pedicelled spikelets 4 mm long *C. fulvus*
13. Upper glume of the sessile spikelet glabrous on the back or shortly ciliate in the upper quarter only:—
14. Upper glume rounded in lower three-quarters, keeled and ciliate in upper quarter; branches whorled; spikelets few; sessile spikelets 6–7 mm long; pedicelled spikelets 6–7 mm long *C. serrulatus*
14. Upper glume rounded on the back and not keeled above; spikelets many, branches alternate *Capillipedium venustum**
10. Leaves puberulous:—
15. Basal sheaths silky, terete; peduncle puberulous or scabrid below panicle *C. aucheri*
15. Basal sheaths villous, compressed, keeled; peduncle glabrous below the panicle *C. velutinus*
- ✓ 1. **Chrysopogon aciculatus** (Retz.) Trin., Fund. Agrost. 188 (1820).
Andropogon aciculatus Retz., Obs. Bot. 5, 22 (1789).
A. acicularis Retz. ex Roem. et Schult., Syst. Veg. 2, 812 (1817).
A. javanicus Steud., Syn. Pl. Glum. 1, 396 (1854).
Chrysopogon trivialis Arn. et Nees in Nov. Act. Nat. Cur. 19, Suppl. 1, 171 (1843).
Rhaphis acicularis (Retz.) Desv., Opusc. 69 (1831).
R. javanica Nees ex Steud., loc. cit. 396 (1854) as synonym.
R. trivalvis Lour., Fl. Cochinch. 553 (1790).
Centrophorum chinense Trin., Fund. Agrost. 106 (1820) t. 5.

Distribution: Widely distributed in the tropics of Asia in hills and plains.

An extremely common grass in village pasture in the plains where the prostrate creeping stems resist overgrazing and trampling. Grazing animals suffer severely from the ripe fruits becoming attached to their

* Included here because of its non-translucent pedicel which may mislead those using the generic key. See page 113

A rather coarse perennial which is considered to be a good fodder.
Exsicc.—*R. R. Stewart* 10110, Kashmir.

14. ***Chrysopogon velutinus*** (*Hook. f.*) *Bor*, comb. nov.

Andropogon velutinus *Hook. f.*, *Fl. Brit. Ind.* 7, 194 (1896).

Distribution: South India.

A very obscure species with compressed stems of which more material is urgently needed.

Exsicc.—*Herb. Wight*. 2314, Madras.

15. ***Chrysopogon verticillatus*** (*Roxb.*) *Trin. ex Steud.*, *Nom. Bot.* ed. 2, 1, 360 (1840).

Andropogon verticillatus *Roxb.*, *Fl. Ind.* 1, 267 (1820).

Distribution: Madras State in the mountainous areas, also in Orissa.

This is a very stout, woody species with a hard rootstock. When full grown it is hardly acceptable to cattle but the young leaves and shoots are undoubtedly eaten.

Exsicc.—*Bourne* 3420, Madras; *H. F. Mooney* 3664, Sambalpur.

✓ 16. ***Chrysopogon zeylanicus*** (*Nees*) *Thw.*, *Enum. Pl. Zeyl.* 366 (1864).

Andropogon zeylanicus *Nees ex Steud.*, *Syn. Pl. Glum.* 1, 397 (1854).

A. nodulibarbis *Hochst. ex Steud.*, loc. cit. 396.

A. peninsulae *Steud.*, loc. cit. 396.

Distribution: Madras State, Nilgiris and Ceylon above 1800 m.

A very large tufted grass.

Exsicc.—*Bourne* 1985, Madras; *F. Ballard* 1164, Ceylon. $2n = 20$.

Cleistachne *Benth. in Hook.*, *Ic. Pl.* t. 1379 (1882).

Key to the species of *Cleistachne*

1. Spikelets 3–3.5 mm long; hairs on spikelets and pedicels rufous-brown

C. stocksii

1. Spikelets 4.5–5 mm long; hairs on spikelets and pedicels whitish or grey

C. sorghoides

1. ***Cleistachne sorghoides*** *Benth. in Hook.*, *Ic. Pl.* 14 (1882) t. 1379.

Distribution: East Tropical Africa and Madhya Pradesh.

There is only one Indian collection, namely, *Mooney* 1991 from Kangina, Khairagarh State.

Exsicc.—*H. F. Mooney* 1991; Sambalpur. $2n = 36$.

✓ 2. ***Cleistachne stocksii*** *Hook. f.*, *Fl. Brit. Ind.* 7, 162 (1896).

Distribution: Konkan and Malabar.

This is an annual grass despite Hooker's statement to the contrary. It is unlikely to be of any account as a fodder grass.

Exsicc.—*Law* s.n., Malabar; *Meebold* 13122, Travancore.

Coelorhachis Brongn. in Duperr., Voy. Coquille Bot. 64 (1831) t. 14.

Key to the species and varieties of *Coelorhachis*

1. Lower glume of the sessile spikelet with 4-7 upwardly directed hooks on each lateral keel; pedicel ribbon-shaped and crowned by the rudiments of a spikelet
C. glandulosa
1. Lower glume of the sessile spikelets entirely devoid of hooks:—
 2. Lower glume of the sessile spikelet with 4-6 lines of interrupted or continuous slits or sometimes the slits partly replaced by tubercles:—
 3. Panicles very congested, consisting of fascicles of 4-6-noded branches carrying the racemes and issuing from the axil of an upper leaf, with a spathe at each node; pedicelled spikelet usually well developed, often as long as the sessile
C. khasiana
 3. Panicles consisting of several long raceme-bearing branches issuing from the axil of an upper leaf, 2-3-noded and forming an exceedingly open panicle; pedicelled spikelet usually reduced to a rudimentary lower glume
C. striata
 4. Culms very glabrous; sheaths glabrous except for the ciliate margin; blades glabrous on both surfaces
C. striata var. *striata*
 4. Culms hairy above; sheaths and leaf-surfaces pubescent
C. striata var. *pubescens*
 2. Lower glume of the sessile spikelet without lines of interrupted or continuous slits or isolated tubercles:—
 5. Back of the lower glume of the sessile spikelet concave below; racemes solitary, subsessile in the sheaths
C. helferi
 5. Back of the lower glume of the sessile spikelet flat not concave; racemes several on long peduncles well exerted from the sheaths
C. striata var. *laevis*

1. *Coelorhachis glandulosa* (Trin.) Stapf ex Ridley, Fl. Malay Penin. 5, 204 (1925).

Rottboellia glandulosa Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 250 (1832).

Manisuris glandulosa (Trin.) O. Ktze., Rev. Gen. Pl. 2, 780 (1891).

Ophiurus muricatus Steud. in Zoll., Syst. Verz. 57 (1854).

Distribution: Malaya, Siam to Java and the Philippines.

A very stout grass found in waste places. As this plant is extremely common in the Malay Peninsula, it is to be expected in South Burma.
2n = 54.

2. *Coelorhachis helferi* (Hook. f.) Henr. in Blumea 4, 518 (1941).

Rottboellia helferi Hook. f., Fl. Brit. Ind. 7, 158 (1896).

Distribution: Burma, Tenasserim.

A very coarse, tall, stout grass.

Exsicc.—*Helper* s.n., Burma.

3. **Coelorhachis khasiana** (Hack.) Stapf ex Bor, in Indian For. Rec. (Bot.) 1, 3, 101 (1938).

Rottboellia striata Nees ex Steud., subsp. *khasiana* Hack. in DC., Monogr. Phan. 6, 302 (1889).

Distribution: Khasi Hills and Sikkim, Burma.

This very coarse grass often grows gregariously in small patches in openings in the pine forests and in waste places, about 1000 m and above. Exsicc.—N. L. Bor 18141, Naga Hills; J. S. Gamble 7266, Sikkim; C. E. Parkinson 288, Burma.

4. **Coelorhachis striata** (Nees ex Steud.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 197 (1921).

Rottboellia striata Nees ex Steud., Syn. Pl. Glum. 1, 361 (1854).

var. **striata**.

Distribution: India and South-east Asia generally.

Exsicc.—Meebold 6021, Manipur.

var. **pubescens** (Hack.) Bor, comb. nov. (Hack.) Henr. in Blumea 4:519 (1941)

Rottboellia striata Nees subsp. *genuina* var. *pubescens* Hack. in DC., see additions 1973

Monogr. Phan. 6, 302 (1889).

Distribution: Khasi Hills and Silhet.

Exsicc.—Hook. f. et T. Thoms. s.n., Khasia.

var. **laevis** Stapf mss. var. nov., gluma inferiore laevis haud punctata distincta.

Distribution: Burma, Tongdong.

Exsicc.—Wallich 8877D, Burma.

Very coarse grasses.

Cymbopogon Spreng., Pl. Pugill. 2, 14 (1815).

Gymnanthelia Anderss. in Schweinf., Beitr. Fl. Aethiop. 299 (1867) nomen.

Key to the species and varieties of *Cymbopogon*

1. Sessile spikelets without an awn or the awn reduced to a bristle not visible outside the spikelet:—
 2. Lower glume of the sessile spikelet flat, slightly convex or shallowly concave:—
 3. Sessile spikelets linear or linear-lanceolate in outline, 5–6 mm long, 0.7 mm wide; lower glume usually shallowly concave in the lower half; no intracarinial nerves *C. citratus*
 3. Sessile spikelets oblong-ob lanceolate, oblong, lanceolate-oblong, acute, 3.5–5.5 mm long; lower glume flat on the back or at the most very shallowly concave in the lowest quarter:—
 4. Panicle large, decompound, spreading, loose, nodding; lower glumes with three definite intracarinial nerves, convex or flat on the back, 3.5–5.5 mm long, 1–1.2 mm wide *C. winterianus*

4. Panicle much congested, often interrupted, not loose or spreading, finally drooping; lower glumes without obvious intracardinal nerves, flat in the upper half, 4-4.5 mm long, 1-1.1 mm wide
C. nardus var. *nardus*
C. osmastonii
2. Lower glume of the sessile spikelet with a slit-like groove in the lower half
1. Sessile spikelets awned:—
5. Panicles narrow, of short dense fascicles of raceme-pairs; joints and pedicels villous all over; hairs long, more or less concealing the sessile spikelets:—
6. Lower glume of the sessile spikelets pubescent in the groove; pedicel of the lowest pedicelled spikelet in the subsessile raceme swollen, hard, shining or hairy; basal sheaths woolly; pedicelled spikelets hairy on the nerves
C. parkeri
6. Lower glume of the sessile spikelets smooth and glabrous; pedicel of the lowest pedicelled spikelet not enlarged; basal sheaths not woolly; pedicelled spikelets glabrous:—
7. Leaf-blades more or less filiform and flexuous; sheaths widened and thickened below, the old ones never curled in a spiral
see addenda 1973. *C. olivieri* *C. schoenanthus*
7. Leaf-blades flat; basal sheaths when old slipping from the culm and becoming curled in a characteristic spiral *C. jwarancusa*
5. Panicles often very large, decompound or compound, drooping, sometimes narrow but then with hairs not covering the joints and pedicels but confined to the edges of the joints and pedicels and increasing in length from below upwards and not concealing the sessile spikelets:—
8. Lower glume of the sessile spikelets with a deep slot-like depression occupying most of its length:—
9. Pedicel of the lowest pedicelled spikelet in the subsessile raceme much swollen:—
10. Spikelets 2.5-3.5 mm long; spatheoles 10-12 mm long; racemes 4-6 mm long
C. microtheca
10. Spikelets 4-4.5 mm long; spatheoles 16-20 mm long; racemes 15-20 mm long:—
11. Lower glume of the sessile spikelets with a conspicuous boss at the lower end:—
12. Branches at the nodes of the axis usually more than two; panicle short, congested; branches and peduncle short
C. gidarba var. *gidarba*
12. Branches at the nodes of the panicle usually two; peduncles and branches very long
C. gidarba var. *burmanicus*
11. Lower glume of the sessile spikelet without a pronounced boss
C. stracheyi
9. Pedicel of the lowest pedicelled spikelet not swollen or not conspicuously so; spikelets over 4 mm long:—

13. Lower glumes of the sessile spikelets puberulent in the slot; spikelets 4.5–6.5 mm long:—
14. Spikelets 5.5–6.5 mm long *C. hookeri*
14. Spikelets 4.5–5 mm long:—
15. Lower glumes with a boss at the lower end of the slot *C. gidarba*
15. Lower glumes with only an indication of a boss or without one *C. stracheyi*
13. Lower glumes quite glabrous:—
16. No trace of a boss at the lower end of the slot *C. tibeticus*
16. A definite boss or at least a swelling present:—
17. Boss present *C. gidarba*
17. Boss reduced to a slight swelling *C. stracheyi*
8. Lower glume without a slot, either flat, convex, shallowly concave or with a deep narrow slit in the lower half:—
18. Lower glume of the sessile spikelet with a narrow slit-like groove in the lower half which appears as a rib on the inner surface:—
19. Pedicel of the lowest pedicelled spikelet in the sessile raceme not swollen:—
20. Sessile spikelets 2.5–3 mm long; racemes 7–10 mm long; joints and pedicels very shortly ciliate *C. osmastonii*
20. Sessile spikelets 4.4–5 mm long; racemes 15–20 mm long; joints and pedicels long-ciliate *C. polyneuros*
19. Pedicel of the lowest pedicelled spikelet swollen; sessile spikelets 3.5 mm or more long:—
21. Pedicelled spikelets hairy *C. clandestinus*
21. Pedicelled spikelets glabrous:—
22. Leaves cordate and amplexicaul at the base, linear-lanceolate to lanceolate, tapering *C. martinii*
22. Leaves linear-acuminate, not cordate, narrow, rounded at the base:—
23. Lower glume of the sessile spikelet grooved from the base to apex as well as having a slit-like groove, the groove bordered on each side by a brown streak *C. nervatus*
23. Lower glume of the sessile spikelet without a groove in addition to a slit, not decorated with brown streaks; whole plant rather glaucous *C. caesius*
18. Lower glume of the sessile spikelet flat, slightly convex, shallowly concave, wrinkled or with 1–3 very shallow depressions:—
24. Pedicel of the lowest pedicelled spikelet in the sessile raceme not swollen:—
25. Inflorescence very congested; racemes 1.5–2 cm long;

GRASSES OF INDIA, BURMA AND CEYLON

sessile spikelets 4.5–5(6) mm long, 1 mm broad, with 1–3 intracarinal nerves on the lower glume; spatheoles brown; spikelets usually tinged with purple

C. nardus var. *confertiflorus*

25. Inflorescence lax and loose or if congested then the racemes very short, not more than 1.2 cm long:—

26. Sessile spikelets 6–8 mm long:—

27. Sessile spikelets oblong-acuminate or oblong-elliptic-acuminate, sometimes oblique, 1–1.5 mm broad; lower glume flat on the back or very shallowly depressed in the lower half; inflorescence a simple panicle with few raceme-pairs, erect; racemes 2.5–3.5 cm long:—

28. Leaves filiform, flexuous

C. distans

28. Leaves flat, petioled at base

C. thwaitesii

27. Sessile spikelets oblong-obtuse or oblong-acute, 1 mm broad; lower glume definitely grooved on the dorsal surface in the lower half; inflorescence narrow, drooping, with sheaths at the nodes 2.5–7.5 cm long; raceme-pairs numerous; racemes 2 cm long; no median nerve in lower glume of sessile spikelet

C. pendulus

26. Sessile spikelets less than 6 mm long, or if as long with a shallow groove in the lower glume:—

29. Peduncle longer than, as long as, or only slightly shorter than the spatheole; lower glume of sessile spikelet 1-nerved or nerveless

C. exsertus

29. Peduncles very much shorter than the spatheoles:—

30. Lower glume of the sessile spikelet with a concave groove from base to near apex

C. pendulus

30. Lower glume of the sessile spikelet flat, puckered or wrinkled, without a concave groove:—

31. Racemes very short, about 1.2 cm long; panicle not drooping, usually with very sparse pairs of spikelets; sessile spikelets 4 mm long, 0.8–0.9 mm wide; intracarinal nerves definite; lower glume flat on the back or more often wrinkled with one or two depressions

C. virgatus

31. Racemes longer, or if about 1.2 cm long, the panicle very large, drooping, of exceedingly many pairs of racemes:—

32. Panicle very lax, greyish or greyish-green, rarely with a tinge of purple, with numerous slender, long, flexuous branches; lower glumes of the sessile spikelets 3–4, rarely 4.5 mm long, 1 mm wide, with 1–3 definite or obscure

intracarpal nerves, shallowly concave, or wrinkled with one or two depressions:—

33. Panicle decompound with the raceme-pairs in dense masses *C. flexuosus* var. *flexuosus*

34. Panicle very large with long drooping branches, at each node of which arise 1–3 branchlets ending in the spatheole subtending the raceme-pair

C. flexuosus var. *sikkimensis*

34. Panicle long, slender, erect, bearing a very few distant solitary, erect, filiform branches with one or two very small epinastically deflexed racemes

C. flexuosus var. *microstachys*

32. Panicle not at all lax, often somewhat congested, most often stained with purple; lower glumes of sessile spikelets with 5–7 conspicuous intracarpal nerves, 4.5–5.5 mm long, 1–1.25 mm wide, fairly broadly winged, flat on the back, shallowly concave in the lower half:—

35. Lower glume of sessile spikelet glabrous

C. khasianus var. *khasianus*

35. Lower glume of sessile spikelet hairy

C. khasianus var. *nagensis*

24. Pedicel of the lowest pedicelled spikelet in the sessile raceme grotesquely swollen:—

36. Panicle narrow, interrupted, congested, reddish; sessile spikelets 5–6 mm long, concave at the base; nodes bearded; hairs on joints and pedicels grey, conspicuous

C. coloratus

36. Panicle very effuse, spreading and drooping, pale green or grey; sessile spikelets 3.5–4.5 mm long, with one or two shallow depressions in the lower half; nodes glabrous

C. travancorensis

1. ***Cymbopogon caesius*** (Nees) Stapf in Kew Bull. 1906, 341, 360 (1906).

Andropogon caesius Nees in Wight, Cat. nos. 1700a, 1700b (1833) nomen nudum; et Nees ex Hook. et Arn., Bot. Beech. Voy. 244 (1838) descr.

A. schoenanthus subsp. *genuinus* var. *caesius* Hack. in DC., Monogr. Phan. 6, 610 (1889).

A. schoenanthus var. *gracillimus* Hook. f., Fl. Brit. Ind. 7, 205 (1896).

Distribution: Common in India and north-east Africa.

This species is particularly abundant in the neighbourhood of Bangalore where it is known as Kachi grass. It yields an oil which is somewhat

Dichanthium Willemet in Usteri, Neue Ann. der Bot. 18, 11 (1796).

Lepeocercis Trin., Fund. Agrost. 203 (1820).

Key to the species of *Dichanthium*

1. Upper lemma 2-lobed with the awn issuing between the lobes
D. polyptychum
1. Upper lemma the hyaline base of the awn:—
 2. Peduncle of the racemes hairy
D. aristatum
 2. Peduncle of the racemes glabrous:—
 3. Small creeping species with last 18 cm erect; raceme solitary, of tightly overlapping spikelets; lower glume of the sessile spikelet with a shallow longitudinal furrow
D. pallidum
 3. Plants not as above:—
 4. Lower glumes of the pedicelled spikelets armed with marginal bulbous-based bristles:—
 5. Lower glume of pedicelled spikelet always pitted
D. panchganiense
 5. Lower glume of the pedicelled spikelet not pitted:—
 6. Lower glume of the sessile spikelet pitted
D. armatum
 6. Lower glume of the sessile spikelet not pitted
D. maccannii
 4. Lower glumes of the pedicelled spikelets not armed with marginal bulbous-based bristles:—
 7. Raceme solitary, 8 cm long; lowest six pairs of spikelets sterile
D. theinlwini
 7. Racemes usually more than one, not more than 6 cm long, usually shorter; not more than three pairs of the lowest spikelets sterile:—
 8. Lower glume of the sessile spikelet obovate or oblong-truncate, without a median nerve; sheaths compressed; ligule a short ciliate membrane
D. caricosum
 8. Lower glume of the sessile spikelet oblong, obtuse or truncate; keel not winged; median nerve present; sheaths terete; ligule longish
D. annulatum

✓ 1. ***Dichanthium annulatum*** (Forssk.) Stapf in Prain, Fl. Trop. Afr. 9, 178 (1917).

Andropogon annulatus Forssk., Fl. Aegypt.-Arab. 173 (1775).

A. comosus Link, Hort. Berol. 1, 239 (1827).

A. garipensis Steud., Syn. Pl. Glum. 1, 379 (1854).

A. ischaemum Roxb. ex Wight, Cat. (1834) nomen.

A. obtusus Nees in Hook. et Arn., Bot. Beech. Voy. 243 (1838).

A. scandens Roxb., Fl. Ind. 1, 262 (1820).

Lepeocercis annulata (Forssk.) Nees, Fl. Afr. Austr. 98 (1841).

Distribution: Widespread in India and Burma, Tropical and North Africa, but not so far found in Ceylon.

Andropogon fastigiatus Sw., Prod. Veg. Ind. Occ. 26 (1788).

A. hochstetteri Steud., Syn. Pl. Glum. 1, 384 (1854).

A. diatherus Hochst. ex Steud., loc. cit. 378.

Pollinia fastigiata (Sw.) Spreng., Pugill. 2, 13 (1815).

Heteropogon hochstetteri (Steud.) Anderss. in Schweinf., Beitr. Fl. Aethiop. 306 (1867); page numbered 310 in error.

Distribution: Tropics of both hemispheres.

A very good fodder grass in the young stages before the awns begin to form. It turns red as it dries. $2n = 20$.

Exsicc.—*Mokim* 1356, Bengal; *H. H. Haines* 184, Madhya Pradesh; *Helfer* s.n., Tenasserim.

Dimeria R.Br., Prodr. Fl. Nov. Holl. 204 (1810).

Haplachne J. S. ex C. B. Presl, Rel. Haenk. 1, 234 (1830) t. 38.

Didactylon Zoll. et Moritz in Moritz, Verz. 99 (1846).

Psilostachys Steud., Syn. Pl. Glum. 1, 413 (1855).

Pterygostachyum Nees ex Steud., loc. cit. 413.

Woodrowia Stapf in Hook., Ic. Pl. sub. tab. 2447 (1896).

Key to the species and varieties of *Dimeria*

1. Spikelets 8–12 mm long *D. blatteri*
1. Spikelets not above 7 mm long:—
 2. Spikelets awnless, rather blunt, 3–3.25 mm long; upper glume broadly winged, 1 mm broad; lower glume winged just below tip *D. alata*
 2. Spikelets awned:—
 3. Racemes 2; each rhachis circinately involute forming a hoop; spikelets rather distant, imperfectly awned *D. woodrowii*
 3. Racemes 1–10; rhachis straight or flexuous:—
 4. Upper glume awnless, sometimes mucronate:—
 5. Perennials:—
 6. Rhachis flattened or triangular in section:—
 7. Spikelets often fuscous, 5–7 mm long, acuminate or acute; rhachis glabrous, triangular in section:—
 8. Upper glume with a broad wing from base to apex; racemes 2, widely divergent; leaves congested at base where the internodes are very short *D. ballardii*
 8. Upper glume with a narrow wing or wingless; racemes 2 or more, most often 3; internodes not shortened at base *D. fuscescens*
 7. Spikelets not fuscous, pale, often reddish to dark brown, acute at the tip; rhachis ciliate to densely pilose on the margins, flattened:—
 9. Upper glume with a broad papery wing; spikelets 4–4.5 mm long; anthers 1–1.5 mm long *D. lehmannii*

9. Upper glume without a wing or the wing confined to an area just below the tip; anthers 2 mm long
D. trimenii
6. Rhachis filiform:—
 10. Sheaths smooth and glabrous; nodes bare; internodes of the raceme about 2.75 mm long; spikelets 5.5–6 mm long
D. gracilis
 10. Sheaths and nodes covered with a dense growth of tubercle-based hairs; internodes of the raceme 4–5 mm long; spikelets 6–7 mm long
D. velutina
5. Annuals:—
 11. Rhachis filiform or trigonous:—
 12. Spikelets 3–3.5 mm long, parallel to the rhachis; pedicels less than 0.5 mm long; callus not longer than 0.25 mm; glumes not winged
D. hohenackeri
 12. Spikelets 4–7 mm long, spreading; pedicels up to 2 mm long; callus not less than 0.5 mm long; upper glume with a rounded corky wing on the back
D. stapfiana
 11. Rhachis flattened:—
 13. Raceme one only:—
 14. Upper glume not winged or if winged, winged at the tip only:—
 15. Upper glume not winged; tip not recurved; awn 12–18 mm long; spikelets 3–3.5 mm long
D. kurzii
 15. Upper glume winged just below the tip; tip recurved; awn 10–11 mm long; spikelets 5.5–6 mm long
D. ceylanica
 14. Upper glume winged from base to apex:—
 16. Lower glume with a thick corky wing; wing of upper glume corky; tip of upper glume acuminate
D. mooneyi
 16. Lower glume not winged; wing of upper glume papery; tip of upper glume acute
D. fischeri
 13. Racemes more than one:—
 17. Upper glume winged all along or at least at the tip:—
 18. Upper glume winged all along:—
 19. Upper glume narrowly winged all along the keel; rhachis narrow, 0.75 mm wide; racemes rarely divergent; spikelets 3.5–4 mm long
D. connivens
 19. Upper glume broadly winged on the keel; rhachis broader, 1–1.25 mm wide; racemes usually divergent:—
 20. Wing of the upper glume corky:—
 21. Spikelet 4–6.5 mm long; both glumes broadly winged; upper glume acuminate
D. mooneyi

21. Spikelet 3-3.5 mm long; upper glume with a corky wing; upper glume acute
20. Wing of the upper glume thin and papery or chartaceous; spikelets 5 mm long *D. bialata*
18. Upper glume winged just below the tip only:— *D. pubescens*
22. Tip of the upper glume recurved *D. ceylanica*
22. Tip of the upper glume not recurved:—
23. Spikelets 4-4.25 mm long; tip of the upper glume expanded into a papery wing; anthers less than 1 mm long *D. orissae*
23. Spikelets 3.5 mm long; tip with a very minute wing; anthers 1.5 mm long *D. deccanensis*
17. Upper glume not winged:—
24. Spikelets 1-2.5 mm long; anthers 0.5 mm long or less:—
25. Spikelets 1.5-2.5 mm long; anthers 0.5 mm long *D. ornithopoda* var. *ornithopoda*
25. Spikelets 1 mm long; anthers 0.25 mm long *D. ornithopoda* var. *gracillima*
24. Spikelets 2.5-3.5 mm long; anthers 0.75-1.5 mm long:—
26. Spikelets 3.5 mm long; anthers 0.75-0.8 mm long *D. ornithopoda* var. *hasiana*
26. Spikelets 2.5-3 mm long; anthers 1.5 mm long *D. ornithopoda* var. *megalantha*
4. Upper glume awned:—
27. Upper glume winged from base to apex:—
28. Rhachis of the racemes flat on the back, winged, ciliate on the margins, 0.75 mm wide; callus very short; tip of upper glume recurved *D. lawsonii*
28. Rhachis of the racemes very narrow, 0.4 mm wide, not winged; callus up to 1.5 mm long; tip of upper glume not recurved: *D. avenacea*
- 28a. Glumes sparsely hairy var. *avenacea*
- 28a. Glumes copiously silky-ciliate var. *elator*
27. Upper glume not winged along the back, if winged at all, at the tip only:—
29. Callus 1.5 mm long; awn of upper glume 3 mm long; articulation between pedicel and callus extremely oblique *D. acutipes*
29. Callus 0.4 mm long; awn of upper glume 1 mm long; articulation not oblique *D. thwaitesii*
1. ***Dimeria acutipes* Bor** in Kew Bull. 1952, 560 (1953).
Distribution: Madras State, endemic.

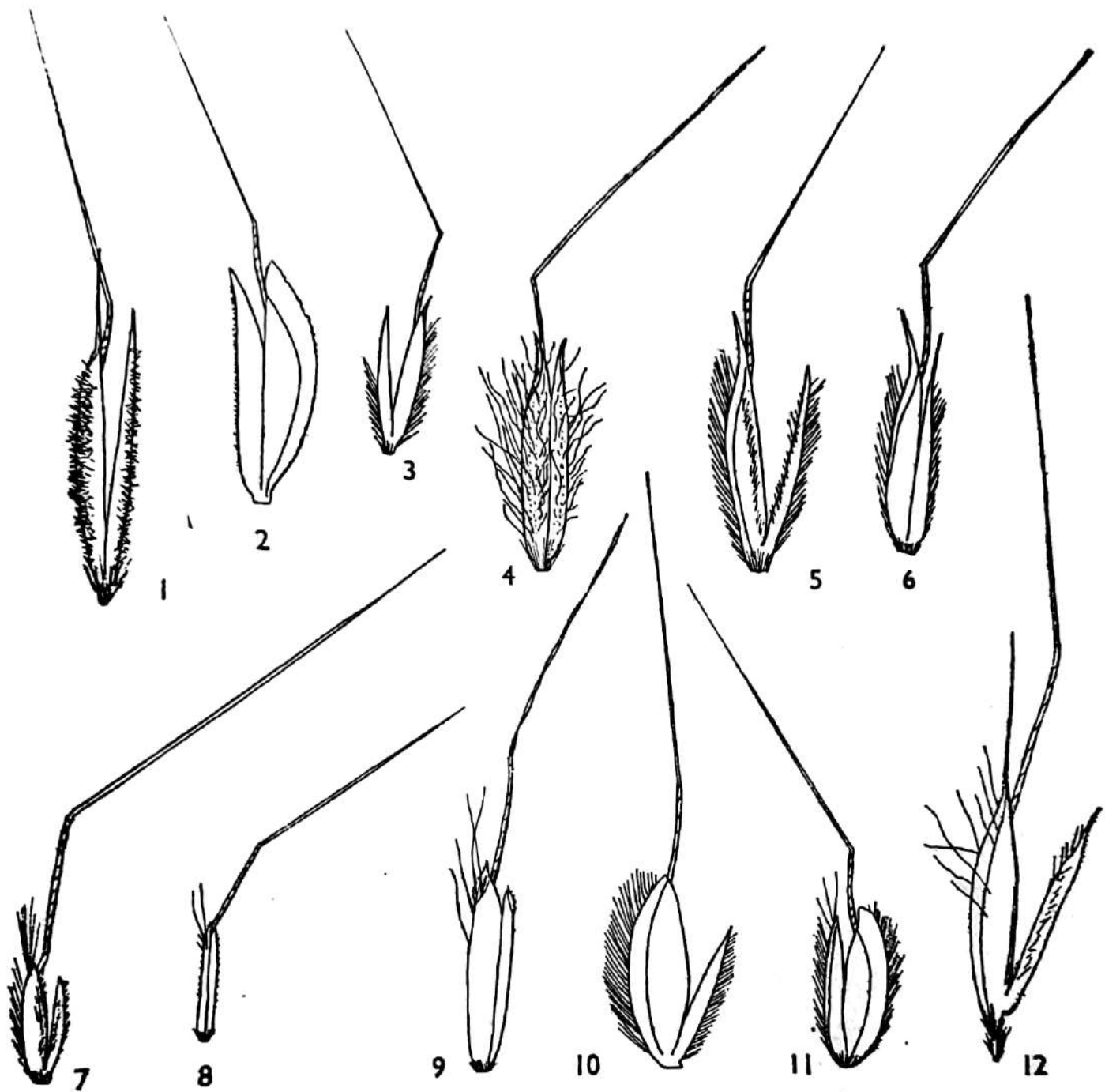


Fig. 3. *Dimeria* R.Br.: Spikelet silhouettes.

1, *Dimeria thwaitesii* Hack.; 2, *D. ballardii* Bor; 3, *D. deccanensis* Bor; 4, *D. gracilis* Nees; 5, *D. lawsonii* (Hook. f.) C. E. C. Fisch.; 6, *D. lawsonii* (Hook. f.) C. E. C. Fisch.; 7, *D. kurzii* Hook. f.; 8, *D. ornithopoda* Trin. from type sheet; 9, *D. orissae* Fisch.; 10, *D. fischeri* Bor; 11, *D. bialata* C. E. C. Fisch.; 12, *D. avenacea* (Retz.) Bor; 10, *D. fischeri* Bor; 11, *D. bialata* C. E. C. Fisch. All $\times 5$.

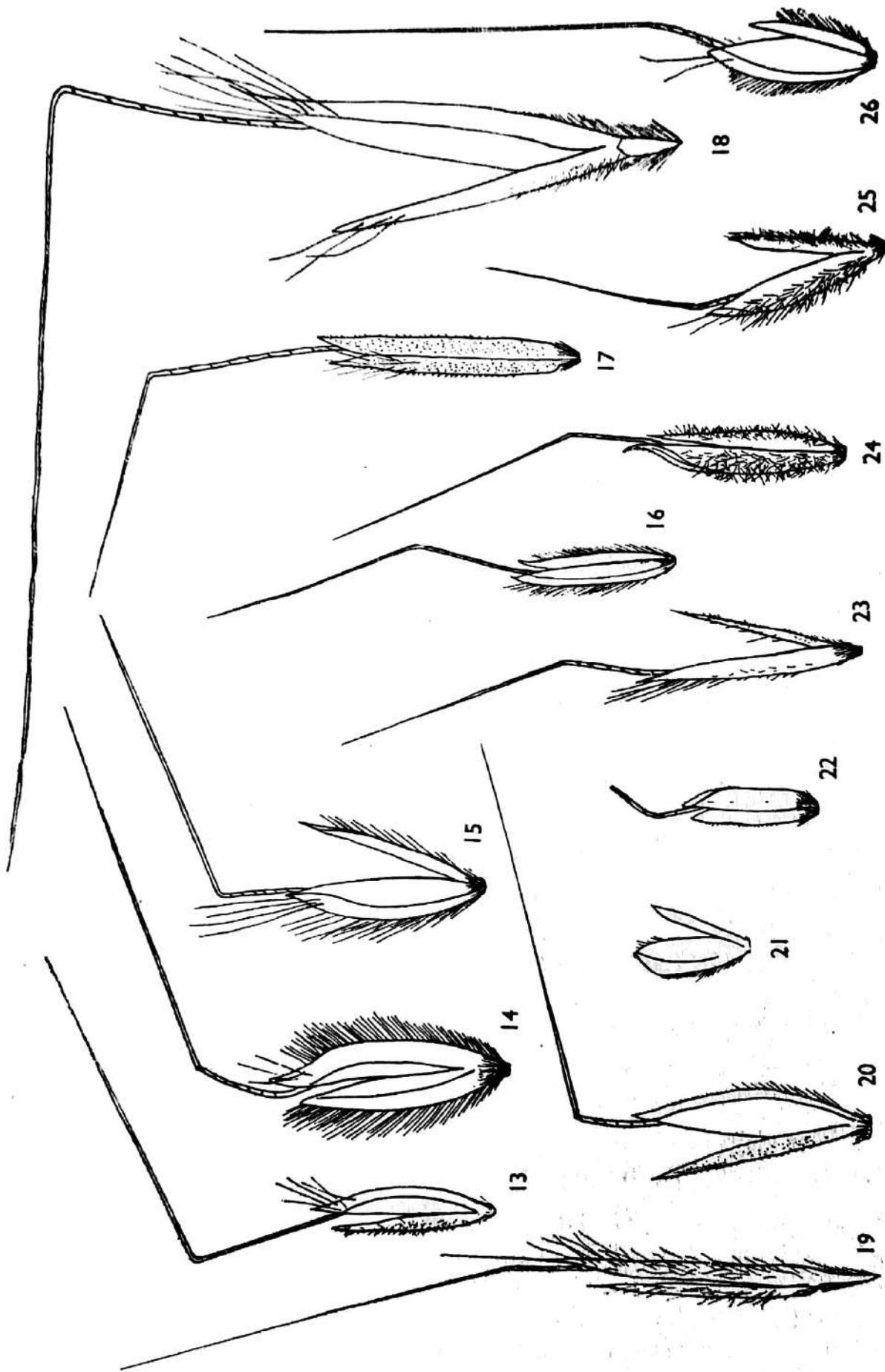


Fig. 4. *Dimeria* R.Br.: Spikelet silhouettes.

13, *D. stapfiana* C. E. Hubbard; 14, *D. mooneyi* Raiz.; 15, *D. pubescens* Hack.; 16, *D. comiens* Hack.; 17, *D. velutina* Bor.; 18, *D. blatterii* Bor.; 19, *D. acutipes* Bor.; 20, *D. fuscescens* Trin.; 21, *D. alata* Hook. f.; 22, *D. woodrowii* Stapf; 23, *D. hohenackeri* Hochst.; 24, *D. ceylanica* Bor.; 25, *D. trimerii* Hook. f.; 26, *D. lehmannii* (Nees) Hack. All $\times 5$.

A very strange species in which the rachis of each raceme is coiled into a hoop.

Exsicc.—Type at Kew (*W. A. Talbot* 2557, Bombay).

***Eccoilopus* Steud., Syn. Pl. Glum. 1, 123 (1854).**

1. ***Eccoilopus cotulifer* (Thunb.) A. Camus** in Ann. Soc. Linn. Lyon, n.s. 70, 92 (1923).

Andropogon cotulifer Thunb., Fl. Jap. 41 (1784).

Eulalia cotulifera (Thunb.) Munro ap. Miq., Prol. Fl. Jap. 177 (1866).

Eccoilopus andropogonoides Steud., Syn. Pl. Glum. 1, 124 (1854).

Miscanthus cotulifer (Thunb.) Benth. in J. Linn. Soc. (Bot.) 19, 65 (1881).

Spodiopogon cotulifer (Thunb.) Hack. in DC., Monogr. Phan. 6, 187 (1889).

Distribution: Temperate Himalaya, Khasi and Naga Hills, China and Japan.

Usually found in swampy localities. $2n = 40$.

Exsicc.—*Hook. f. et T. Thoms.*, Khasia.

***Elyonurus* Humb. et Bonpl. ex Willd., Spec. Pl. 4, 941 (1806).**

- ✓ 1. ***Elyonurus royleanus* Nees ex A. Rich.**, Tent. Fl. Abyss. 2, 471 (1851).

Ratzeburgia schimperi Steud., Nom. Bot. ed. 2, 2, 439 (1841) nomen.

Rottboellia elegantissima Hochst. et Steud. ex Steud., loc. cit. 474.

Elyonurus grisebachii Schmidt, Beitr. zur Fl. Capverd. 154 (1852).

Andropogon elegantissimus Steud., Syn. Pl. Glum. 1, 364 (1854).

A. grisebachii Schmidt ex Steud., loc. cit. 365.

Distribution: Upper Gangetic plain, extending to Arabia, Egypt, Abyssinia, Somaliland, Kenya and West Tropical Africa.

Usually found in rocky, inhospitable and arid places.

Exsicc.—*J. F. Duthie* 6552, Bundelkhand; *R. R. Stewart* 24797, Karachi.

***Eremochloa* Büse in Miquel, Pl. Junghn. 1, 357 (1854).**

Pectinaria Hack. in Engler et Prantl, Natürl. Pflanzenf. ed. 1, 2 (2) 26 (1886).

Key to the species of *Eremochloa*

1. Leaves up to 8 mm broad, conspicuously ciliate all along the margins; pedicel of pedicelled spikelet about the length of the rachis-joints; rudimentary spikelet a scabrid seta set at an obtuse angle to the pedicel and as long or longer *E. ciliatifolia*

1. Leaves not more than 4 mm broad and not ciliate all along, occasionally ciliate on the rounded base; pedicelled spikelet represented by a laminate structure as long as or slightly longer than the sessile spikelet, rarely separable into pedicel and spikelet, or if so, then the spikelet reduced to a very short rudiment:—
 2. Lower glume of the sessile spikelet with a pair of fan-shaped or triangular wings at the apex; lateral spines flat, pectinate *E. muricata*
 2. Lower glume very narrowly winged or wingless; lateral spines terete, often slightly expanded at the base:—
 3. Lateral spines as long as the glume is broad:—
 4. Lower glume of sessile spikelet broadly elliptic-oblong, glabrous, with two narrow wings at the apex *E. zeylanica*
 4. Lower glume of sessile spikelet elliptic-acute, usually covered on the dorsal surface with soft white hairs, wingless *E. ciliaris*
 3. Lateral spines shorter than the glume is broad; dorsal surface glabrous; wings at the apex very narrow *E. bimaculata*
1. **Eremochloa bimaculata** Hack. in DC., Monogr. Phan. 6, 265 (1889).
 Distribution: Upper Burma.
 Exsicc.—Griffith 6774, type at Kew.
2. **Eremochloa ciliaris** (Linn.) Merr. in Philipp. J. Sci. 1, Suppl. 4, 331 (1906).
Nardus ciliaris Linn., Sp. Pl. ed. 1, 53 (1753).
Eremochloa horneri Büse in Miquel, Pl. Junghn. 357 (1854).
Ischaemum leersioides Munro in Proc. Amer. Acad. Arts Sci. 4, 363 (1860).
Eremochloa leersioides (Munro) Hack. in DC., Monogr. Phan. 6, 264 (1889).
 Distribution: Burma, Malaya, Siam and China.
 Exsicc.—S. Kurz 1129, Pegu.
3. **Eremochloa ciliatifolia** Hack. in DC., Monogr. Phan. 6, 265 (1889).
E. helferi Munro ex Hook. f., Fl. Brit. Ind. 7, 141 (1896).
Ischaemum helferi Munro in Cat. Griffith, Falconer and Helfer's Plants, 65 (1865) nomen.
 Distribution: Burma, Tenasserim, Malaya.
 Exsicc.—Griffith 6776, Burma.
4. **Eremochloa muricata** (Retz.) Hack. in DC., Monogr. Phan. 6, 262 (1889).
Aegilops muricata Retz., Obs. Bot. 2, 27 (1781).
Rottboellia muricata Retz., Obs. Bot. 3, 12 (1783).
Ischaemum pectinatum Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 296 (1832).
Andropogon pectinatus (Trin.) Steud., Syn. Pl. Glum. 1, 369 (1854).
 Distribution: South India, Ceylon, extending to Australia.
 Exsicc.—Wallich 8867, Madras.

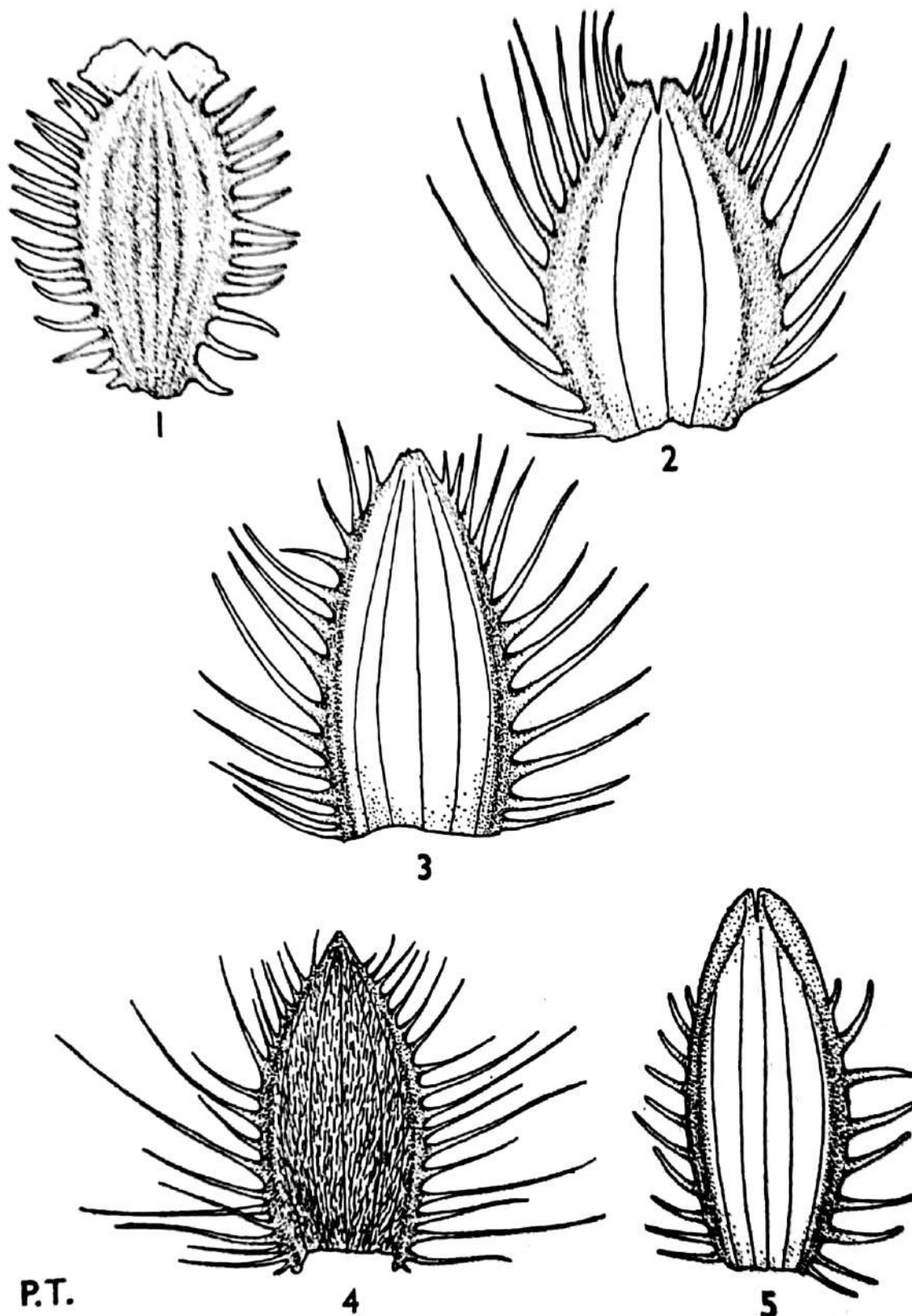


Fig. 5. *Eremochloa* Büse.

Lower glumes of: 1, *Eremochloa muricata* (Retz.) Hack.; 2, *E. ciliatifolia* Hack.; 3, *E. zeylanica* Hack.; 4, *E. ciliaris* (Linn.) Merr.; 5, *E. bimaculata* Hack.; all $\times 10$.

5. *Eremochloa zeylanica* Hack. in DC., Monogr. Phan. 6, 263 (1889).
Ischaemum falcatum Thw., Enum. Pl. Zeyl. 436 (1864) non Nees (1854).
I. zeylanicum Hack. ex Trim., Cat. Ceyl. Pl. 107 (1885).

Distribution: Ceylon.

Exsicc.—*Thwaites* C.P. 3322, Ceylon; type at Kew.

Eremopogon (Hack.) Stapf in Prain, Fl. Trop. Afr. 9, 182 (1917).

Key to the species of *Eremopogon*

1. Lower glume of sessile spikelet with a deep pit, 3–4 mm long, with indefinite, smooth nerves *E. foveolatus*
1. Lower glume of sessile spikelet without a pit, 4–5 mm long, with strong tuberculate nerves *E. tuberculatus*

- ✓ 1. *Eremopogon foveolatus* (Del.) Stapf in Prain, Fl. Trop. Afr. 9, 183 (1917).

Andropogon foveolatus Del., Fl. d'Egypte 16 (1812) t. 8, f.2.

A. strictus Roxb., Fl. Ind. 1, 260 (1832).

A. monostachyus Spreng., Pugill. 2, 9 (1815)?

Eremopogon strictus (Roxb.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 208 (1922).

Hypogynium foveolatum (Del.) Haines, Bot. Bihar and Orissa 1041 (1924).

Distribution: Drier parts of north-western, central and southern India, extending westwards to northern and tropical Africa.

It is considered a good fodder grass and according to Blatter is abundant on the barren uplands of the Dharwar District. $2n = 40$.

Exsicc.—J. F. Duthie 8474, Madhya Pradesh; N. L. Bor s.n., Yellapur, Bombay; Bourne 2427, Madras.

There is some uncertainty about the *Andropogon monostachyus* of Sprengel which appears in the above synonymy. Sprengel says that the plant was collected in Bengal and that "R. Brown in lit. adfine habet *Andropogoni pertuso* Willd. sed hic diversus spicis digitatis corollaque hermaphrodita forata". This seems to suggest that Sprengel's plant had unpitted glumes. *Andropogon pertusus* (Linn.) Willd., now known as *Bothriochloa pertusa* (Linn.) A. Camus, certainly has digitate spike-like racemes and there is a pit in the lower glume of the sessile spikelet. Hackel (1889) quotes *Andropogon monostachyus* in synonymy under *Eremopogon foveolatus*, and as he worked at Berlin must have seen Sprengel's type which now, alas, is among the many treasures in the Berlin Herbarium destroyed in the Second World War. Hackel was followed by both Hook. f. and Stapf, and as he was not likely to have made a mistake one can only conclude that Sprengel quoted R. Brown incorrectly.

Raizada and Jain (1958) have recently examined the material of *Eremopogon foveolatus* at their disposal and have come to the conclusion

that *Andropogon strictus* Roxb. is distinct from *Andropogon foveolatus* Delile. Hackel considered that the former was a variety of the latter. Stapf (1917) does not mention *Andropogon strictus* Roxb. in his synonymy but he does quote *Andropogon monostachyus*, which, if it is the same as *Andropogon strictus*, is an earlier name.

Raizada and Jain base their conclusions on the following points:

<i>Andropogon strictus</i>	<i>A. foveolatus</i>
Culms branched, taller; sessile spikelet about 3 mm long; pedicelled spikelet pitted; upper glume of pedicelled spikelet narrowly lanceolate; margins narrowly incurved.	Culms unbranched, slender; sessile spikelet about 4 mm long; pedicelled spikelet usually not pitted; upper glume of pedicelled spikelet narrowly oblanceolate; margins sharply incurved.

Having recently examined all the material in the Kew Herbarium of *Eremopogon foveolatus* (Del.) Stapf not only from India but also from Afghanistan, Persia, Arabia and Egypt, the following notes of my findings may be worthy of record.

Every one of the characters relied upon to separate *Andropogon strictus* from *A. foveolatus* breaks down. What can be said is the following. The plants from the greater part of India, excluding Sind and Rajasthan, have pits in the lower glumes of pedicelled and sessile spikelets. The plants are green and are more or less uniform over this vast area with a variation in length of spikelet of 2.5–4.5 mm. The plants from the rest of the range, that is west of Sind, are glaucous in colour and the lower glume of the sessile spikelet only is (as a rule) pitted. There is a similar variation in length of spikelet. Some specimens have no pit in the lower glume of the sessile spikelet and there are some with a pit or an indication of one in the pedicelled spikelet. It is obvious that this complex needs cyto-genetical investigation.

2. ***Eremopogon tuberculatus* (Hack.) A. Camus** in Ann. Soc. Linn. Lyon, n.s. 68, 208 (1922).

Andropogon tuberculatus Hack. in DC., Monogr. Phan. 6, 404 (1889). Distribution: Madhya Pradesh, endemic.

It is a handsome grass but rarely collected.

Exsicc.—J. F. Duthie 8465, Madhya Pradesh; J. F. Duthie 10595, Madhya Pradesh.

Erianthus Michx., Fl. Bor. Amer. 1, 54 (1803).*

Ripidium Trin., Fund. Agrost. 169 (1820).

Key to the species and varieties of *Erianthus*

1. Panicle decompound, ultimate branches very short, of 3–4 joints:—
2. Panicle up to 40 cm long by 15 cm broad, very thick with crowded spikelets, purplish; spikelets about 3–4 mm long or somewhat longer;

*The species of *Erianthus* will also be found included under *Saccharum*.

- joints about as long; awn well exerted; glumes of sessile spikelets glabrous, of the pedicelled spikelet with few or sparse hairs; lower glume 2-keeled, spinulose scabrid on the keels *E. ravennae*
2. Panicle up to 25 cm long by 5 cm wide, interrupted, creamy-white; spikelets 6 mm or more long; lower and upper glumes hairy; awn slightly exerted *E. griffithii*
1. Panicle of long simple branches sparingly divided (branches short in *E. rufipilus*):—
3. Awns at least 4 cm long *E. macrathelus*
3. Awns not more than 2 cm long:—
4. Upper lemma entire at the apex, very narrow; leaves almost all midrib:— 5-5.5
- addenda 1973 ed. 5. Spikelets 3-3.5 mm long, twice as long as the joints, surrounded by mauve-coloured long hairs *E. rufipilus*
5. Spikelets 4-5 mm long, as long as the joints, surrounded by silvery-golden or golden hairs *E. sikkimensis*
4. Upper lemma 2-fid at the apex, awned in the sinus; leaves broad to very broad or filiform:—
6. Leaves broad; stems glabrous or pubescent below the nodding inflorescence:—
7. Glumes sparsely or densely hairy:—
8. Stem glabrous below the panicle: spikelets 4-5.5 mm long, equal to or usually longer than the raceme joints; glumes sparsely hairy in the lower third; palea of the upper floret 2 mm long, narrow, shortly ciliate *E. longisetosus* var. *longisetosus*
8. Stem pubescent below the panicle; spikelets 5.5-6.5 mm long, usually longer than the joints of the raceme; lower and upper glumes densely hairy in the lower half; palea of the upper floret short *E. longisetosus* var. *hookeri*
7. Glumes absolutely glabrous; longest callus hairs twice the length of the 4-4.5 mm long spikelets; palea of the upper floret a hyaline scale 0.5 mm long, long ciliate *E. wardii*
6. Leaves narrow, subulate or filiform, almost all midrib; racemes erect; stems pubescent below the panicle:—
9. Spikelets 6 mm long; lower glumes, joints and pedicels covered with golden hairs *E. williamsii*
9. Spikelets 5 mm long; lower glume glabrous, joints and pedicels covered with purplish-reddish hairs *E. filifolius*

1. ***Erianthus filifolius* Nees ex Steud.**, Syn. Pl. Glum. 1, 409 (1855).
Saccharum filifolium Steud., loc. cit. 409.

Distribution: North-western Himalaya, 1500-2000 m.
 The wiry leaves of this stout perennial render its identification easy.
 Exsicc.—J. S. Gamble 25736, Tehri; Trotter 669, Hazara; T. Thoms. s.n., Loharghat; R. R. Stewart 9100, Murree.

Distribution: From Assam through northern India westwards to the Mediterranean.

This gigantic species is too coarse to be of any value as a fodder plant, but the stout culms are used for walling.

Exsicc.—*J. F. Duthie* 10747, Dehra Dun; *H. H. Haines* 2862, Saharanpur; *T. Thoms.* s.n., Chenab; *R. N. Parker* 3413, Lahore. $2n = 20$.

6. ***Erianthus rufipilus* (Steud.) Griseb.** in Nachr. Ges. Wiss. Göttingen 93 (1868).

Saccharum rufipilum Steud., Syn. Pl. Glum. 1, 409 (1855).

S. versicolor Nees ex Steud., loc. cit. 409.

Erianthus fulvus Nees ex Steud., loc. cit. 409, nomen nudum, et ex Hack. in DC., Monogr. Phan. 6, 147 (1889).

E. pallens Hack. in DC., loc. cit. 145.

Distribution: Hills of north and north-east India.

Common in the hills on exposed rocky slopes.

Exsicc.—*J. F. Duthie* 14513, Tehri; *R. R. Stewart* 12430, Kashmir; *Treutler* 835, Sikkim; *F. Kingdon-Ward* 22857, Mt. Victoria, Burma.

7. ***Erianthus sikkimensis* Hook. f.**, Fl. Brit. Ind. 7, 123 (1896).

Saccharum sikkimense (Hook. f.) Narayanaswami ex Bor, Flora Assam, 5, 462 (1940).

Distribution: Sikkim, at an elevation of about 2000 m.

This is a very handsome grass and would merit cultivation for its decorative value.

Exsicc.—*Hook. f.* s.n., Lachen (type K); *R. E. Cooper* s.n., Bhutan.

8. ***Erianthus wardii* Bor** in Kew Bull. 1954, 498 (1955).

Distribution: Burma, North Triangle, Kanjaw, c. 1000 m.

A reed-like grass over 4 m tall. The type is at Kew and was collected by *F. Kingdon-Ward* in Burma.

9. ***Erianthus williamsii* Bor** in Kew Bull. 1957, 413 (1958).

Distribution: Nepal.

Exsicc.—*Stainton, Sykes et Williams* 3670, 4499, Nepal.

***Eriochrysis* P. Beauv.**, Essai Agrost. 8 (1812) t. 4, fig. 11.

Plazerium Willd. ex Kunth, Enum. Pl. 1, 474 (1833).

1. ***Eriochrysis rangacharii* C. E. C. Fisch.** in Kew Bull. 1932, 246 (1932).

Distribution: Madras State, Nilgiris.

This interesting species has been collected on the Downs at about 1800 m altitude, and it is so far the only representative in India of the otherwise wholly tropical African and American genus.

Exsicc.—Type at Kew (*Bourne* s.n., Pykara).

Euclasta Franch. in Bull. Soc. Hist. Nat. Autun 8, 335 (1895).

1. **Euclasta condylotricha** (Hochst.) Stapf in Prain, Fl. Trop. Afr. 9, 181 (1917).

Andropogon condylotrichus Hochst. in Steud., Syn. Pl. Glum. 1, 377 (1854).

A. piptatherus Hack. in Mart. et Eichl., Fl. Bras. 2, 3, 293 (1883).

Euclasta glumacea Franch. in Bull. Soc. Hist. Nat. Autun 8, 336 (1895).

E. graminea Th. et Hél. Durand, Syll. Fl. Congol. 649 (1909).

Sorghum piptatherum (Hack.) O. Ktze., Rev. Gen. Pl. 2, 792 (1891).

Amphilophis piptatherus (Hack.) Nash in North Amer. Fl. 17, 127 (1912).

Distribution: Tropics of America and Africa. It has been collected once in Madhya Pradesh. It is said to be a useful fodder grass. $2n = 40$.

Exsicc.—Mooney 2365, Khairagarh State, Madhya Pradesh (Herb. Dehra Dun).

Eulalia Kunth, Rév. Gram. 1, 160 (1829).

Key to the species and varieties of *Eulalia*

1. Sessile spikelets awned:—

2. Upper glume of the sessile spikelet without an arista:—

3. Panicle of verticillate racemes on a short, laxly villous rhachis, up to 30 cm long; upper lemma 2-toothed *E. fastigiata*

3. Panicle of digitate or fascicled racemes; upper lemma deeply bifid:—

4. Basal sheaths covered with chocolate-coloured, brown, golden or white wool:—

5. Wool at the base brown, reddish-brown or even chocolate-coloured:—

6. Joints of the rhachis half the length of the sessile spikelet; sessile spikelets 4–5 mm long; slender plants *E. phaeothrix*

6. Joints of the rhachis equal in length to the sessile spikelets; sessile spikelets 5 mm long; robust plants *E. birmanica*

5. Wool at the base of the sheaths golden or whitish-brown but not chocolate:—

7. Spikelets about 6 mm long; hairs on rhachis mauve or mauve-reddish *E. siamensis*

7. Spikelets about 4 mm long; wool golden-yellow, pale gold or whitish; leaves broad; hairs on rhachis gold or silvery-gold:—

8. Wool golden-yellow; leaves villous

E. speciosa var. *speciosa*

8. Wool white; leaves glabrous

E. speciosa var. *velutina*

7. Spikelets 2.5–3 mm long; hairs at the base of the sheaths stiff, whitish; leaves narrow; hairs on the rhachis dark brown *E. leschenaultiana*

4. Basal sheaths glabrous:—
 9. Leaves chiefly radical, very slender, almost setaceous, sub-distichous; rhachis and pedicels villous with white hairs; lower glume of sessile spikelet usually dark brown
E. thwaitesii
 9. Leaves not as above, often broad:—
 10. Rhachis and pedicels covered with long silvery-white hairs which conceal the spikelets; racemes 3–5 cm long *E. mollis*
 10. Rhachis and pedicels covered with short golden, pale gold or even pale violet hairs which do not conceal the spikelets; racemes up to 20 cm long or more:—
 11. Perennials:—
 12. Sessile spikelets 4–6.5 mm long; hairs on the rhachis and pedicels coloured, not white:—
 13. Hairs on the rhachis golden or silvery-grey or pale gold; lower glume of sessile spikelet 4-nerved, hispid on the keels, golden-brown in colour, acute or truncate at the tip; nerves green and anastomosing above:—
 14. Leaves narrow, 4–5 mm wide, acuminate-filiform at the tip; lower glume of sessile spikelet narrowly elliptic-acute with narrow flaps
E. quadrinervis
 14. Leaves broad, 8–12 mm wide, acute at the tip; lower glume of sessile spikelet oblong-elliptic with very broad flaps
E. wightii
 13. Hairs on the rhachis pale violet; lower glume of sessile spikelet obscurely 4-nerved, villous on the keels
E. hirtifolia
 12. Sessile spikelets 2.5–3.5 (4) mm long:—
 15. Rhachis and pedicels covered with whitish hairs
E. trispicata
 15. Rhachis and pedicels covered with brownish-golden hairs; basal sheaths and cataphylls with stiff white villae
E. leschenaultiana
 11. Annuals; stems very slender, shining
E. fimbriata
 2. Upper glume of the sessile spikelet with an arista:—
 16. Lower glume of the sessile spikelet bimucronulate at the tip:—
 18. Lower glume of the sessile spikelet 3 mm long, hirsute with white hairs in the middle third; hairs on pedicels and joints of rhachis not concealing the spikelet
E. bicornuta
 18. Lower glume of the sessile spikelet 3–4 mm long, villous on the dorsal surface and keels with long golden hairs which conceal the spikelets
E. staintonii
 16. Lower glume of the sessile spikelet obtuse or bidentate; racemes very villous
E. pallens

1. Spikelets unawned or imperfectly awned; racemes not hairy

E. manipurensis

1. ***Eulalia bicornuta*** Bor in Kew Bull. 1950, 258 (1950).

Distribution: Burma.

Little is known of this plant but it forms part of the grassy vegetation covering open spaces in pure Indaing forest in the Kaukkwe valley.

Exsicc.—Type at Kew (J. H. Lacey 6051, Burma).

2. ***Eulalia birmanica*** (Hook. f.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 204 (1922).

Pollinia birmanica Hook. f., Fl. Brit. Ind. 7, 113 (1896).

Distribution: Burma.

This is, as Hooker surmised, very close to *E. phaeothrix* and very likely only a form of it.

Exsicc.—Type at Kew (Kurz s.n., Burma).

3. ***Eulalia fastigiata*** (Nees) Haines, Bot. Bihar and Orissa 1014 (1924).

Saccharum fastigiatum Nees ex Steud., Syn. Pl. Glum. 1, 409 (1855).

Andropogon loharduggae C. B. Clarke ex Duthie, Fodd. Grasses of N. India, 34 (1888) nomen.

Distribution: North-eastern and Central India.

This is a very robust species in shady, damp places, but is much more slender when exposed to grazing and fire.

Exsicc.—Wallich 8847, Sylhet, Assam; N. L. Bor 20947, Smit, Khasi Hills.

- ✓ 4. ***Eulalia fimbriata*** (Hack.) O. Ktze., Rev. Gen. Pl. 2, 775 (1891).

Pollinia fimbriata Hack. in DC., Monogr. Phan. 6, 164 (1889).

Distribution: Western Himalaya, South India and Burma, extending to Assam.

Often gregarious and, according to Parkinson, the common grass of the Pidaung plains.

Exsicc.—Law, s.n., Concan.

5. ***Eulalia hirtifolia*** (Hack.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 202 (1922).

Pollinia hirtifolia Hack. in DC., Monogr. Phan. 6, 165 (1889).

Distribution: North-west Himalaya, between 1500 and 2500 m.

This species is very close to *E. quadrinervis* and may be only a variety of it. The spikelets are smaller.

Exsicc.—J. F. Duthie 10141, Simla; J. F. Duthie s.n., Landour, Tehri.

6. ***Eulalia leschenaultiana*** (Decne.) Ohwi in Bull. Tokyo Sci. Mus. no. 18, 2 (1947).

Andropogon leschenaultianus Decne., Herb. Timor. Descr. 29 (1835).

Pollinia cumingii Nees in Hook., Kew J. Bot. 2, 98 (1850).

Andropogon aureo-fulvus Steud., Syn. Pl. Glum. 1, 373 (1854).

Distribution: Widely distributed in India, Burma and Ceylon, in the plains and in the hills to an altitude of 2000 m. Also in Malaysia and Australia.

Grows in places, e.g. in the pine forests of the Khasi Hills, in substantial tufts. Elsewhere it occupies waste places and also grows in the grazing lands in the plains in a depauperate form, where it is obviously acceptable to cattle.

Exsicc.—*Herb. Hohenacker* n. 279 (K); *Law* s.n., Canara; *F. Ballard* 1157, Ceylon; *N. E. Parry*, Siju, Garo Hills, Assam.

17. *Eulalia wightii* (Hook. f.) Bor, stat. nov.

Pollinia quadrinervis Hack. var. *wightii* Hook. f., Fl. Brit. Ind. 7, 110 (1896).

Distribution: Pulney Hills.

This species is quite distinct from *E. quadrinervis*. The lower glume of the sessile spikelet is larger, narrowly elliptic-acute with broad flaps, as opposed to the oblong lower glume furnished with narrow flaps of *E. quadrinervis*. The leaves, too, are quite a different shape and the basal nodes are telescoped so that the lower leaves are very crowded.

Exsicc.—Type at Kew: *Herb. Wight* 3390, Pulneys.

Eulaliopsis Honda in Bot. Mag., Tokyo 38, 56 (1924).

Pollinidium Stapf ex Haines, Bot. Bihar and Orissa, 1020 (1924).

Key to the species of *Eulaliopsis*

1. Culms branched; sessile spikelets 3.5 mm long; awn of upper glume 1–2.5 mm long; awn of the upper lemma 3–4.5 mm long *E. binata*
1. Culms simple; sessile spikelets 5 mm long; awn of upper glume 8–8.5 mm long; awn of upper lemma 18–20 mm long *E. sykesii*

1. *Eulaliopsis binata* (Retz.) C. E. Hubbard in Hook., Ic. Pl. sub tab. 3262 (1935).

Andropogon binatus Retz., Obs. Bot. 5, 21 (1789).

Spodiopogon angustifolius Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 300 (1832).

Andropogon notopogon Steud., Syn. Pl. Glum. 1, 373 (1854).

A. involutus Steud. et *A. obvallatus* Steud., loc. cit. 373.

Ischaemum angustifolium (Trin.) Hack. in DC., Monogr. Phan. 6, 241 (1889).

Eulaliopsis angustifolia (Trin.) Honda in Bot. Mag., Tokyo, 38, 56 (1924).

Pollinidium angustifolium (Trin.) Haines, Bot. Bihar and Orissa, 1020 (1924).

P. binatum (Retz.) C. E. Hubbard in Kew Bull. 1932, 72 (1932).

Distribution: Widely distributed in northern India, extending to Burma, Siam, China and the Philippines.

This is the well-known "*sabai*" or "*baib*" grass of which enormous quantities are collected yearly from the forests and other areas and sold for paper making. Opinions differ about its palatability and suitability for fodder but cattle do eat it, possibly in default of anything else. It definitely prefers hot, dry areas, and thanks to its underground root system and woolly base, can withstand forest fires.

Exsicc.—*Royle* s.n., north-west Himalaya; *C. B. Clarke* 14093, Parasnath.

2. ***Eulaliopsis sykesii*** *Bor* in *Kew Bull.* **1957**, 412 (1958).

Distribution: Nepal, 255 m.

Exsicc.—*Polunin, Sykes and Williams* 3170. Dry open slopes.

Germainia *Balans. et Poitr.* in *Bull. Soc. Hist. Nat.*
Toulouse, **7**, 344 (1873).

Key to the species of *Germainia*

- | | |
|---|--------------------|
| 1. Base of the stems covered with white silky wool | <i>G. lanipes</i> |
| 1. Base of the stem glabrous, not covered with wool | <i>G. khasiana</i> |

1. ***Germainia khasiana*** *Hack.* in *Öst. Bot. Z.* **41**, 50 (1891).

Distribution: Khasi Hills and Burma from 150 to 450 m.

It is found forming part of the vegetation of swampy places, often in abandoned paddy fields.

Exsicc.—*C. B. Clarke* 44830A, Khasia.

2. ***Germainia lanipes*** *Hook. f.*, *Fl. Brit. Ind.* **7**, 163 (1896).

Distribution: Tenasserim.

Little is known of this species.

Exsicc.—Type at Kew (*Helper* s.n., Tenasserim).

Hackelochloa *O. Ktze.*, *Rev. Gen. Pl.* **2**, 776 (1891).

Manisuris *Linn. f.*, *Nov. Gram. Gen.* 21 (1779) non *Linn.* (1771).

Manisuris *P. Beauv.*, *Essai Agrost.*, 119 (1812) t. 21, fig. 10, non *Linn.* (1771).

Ryttilix *Raf.* in *Bull. Bot. Seringe*, **1**, 219 (1830).

Key to the species of *Hackelochloa*

- | | |
|--|----------------------|
| 1. Sessile spikelets globose, deeply pitted, 1.5 mm long | <i>H. granularis</i> |
| 1. Sessile spikelets broadly oblong-truncate, ridged or honeycombed, 2–2.5 mm long | <i>H. porifera</i> |

- ✓ 1. ***Hackelochloa granularis*** (*Linn.*) *O. Ktze.*, *Rev. Gen. Pl.* 776 (1891).
Cenchrus granularis *Linn.*, *Mant.* **2**, App. 575 (1771).
Manisuris granularis *Linn. f.*, *Nov. Gram. Gen.* 40 (1779).

M. polystachya P. Beauv., Fl. Owar. et Benin 1, 24 (1805), t. 14.
Rytidix granularis Skeels, U.S. Dept. Agr. Bur. Pl. Indus. 282, 20 (1913).

Distribution: Throughout the tropics.

In Africa this grass has the reputation of being a good fodder at all stages (Dalziel) and is also suitable for hay. Horses are said to be fond of it.

Exsicc.—*Meebold* 11405, Madras; *R. R. Stewart* 23326, Punjab; *Mokim* 1390, Bengal; *A. A. Bullock* 669, Manipur; *J. H. Lace* 4207, Burma.

2. *Hackelochloa porifera* (Hack.) Rhind, Grasses of Burma, 77 (1945).
Manisuris porifera Hack. in Öst. Bot. Z. 41, 48 (1891).

Distribution: Sikkim, Naga Hills, Burma, Tonkin, China.

Little is known of this species.

Exsicc.—*C. B. Clarke* 9752A, Sikkim; *Griffith* 446, Mergui.

Hemarthria R.Br. Prodr. Fl. Nov. Holl. 207 (1810).

Lodicularia P. Beauv., Essai Agrost., 108 (1812).

Key to the species of *Hemarthria*

1. Lower glume of the sessile spikelet constricted suddenly at the apex into a very blunt often bifid point; upper glume acute, not acuminate or tailed:—

2. Lower glume of the sessile spikelet 4–4.5 mm long *H. compressa*

2. Lower glume of the sessile spikelet 5–6.8 mm long:—

3. Callus bearded with golden hairs *H. hamiltoniana*

3. Callus glabrous *H. altissima*

1. Lower glume of the sessile spikelet lanceolate-acuminate; upper glume long-tailed:—

4. Spikelets 8 mm long or over; both glumes of sessile spikelet long-tailed; racemes about 6 mm thick; very stout plants *H. longiflora*

4. Spikelets 4–4.5 mm long; upper glume only long-tailed; racemes 2.5–3 mm thick; slender plants *H. protensa*

1. *Hemarthria altissima* (Poir.) Stapf et C. E. Hubb. in Kew Bull. 1934, 109 (1934).

Rottboellia altissima Poir., Voy. Barb. 2, 105 (1789).

R. fasciculata Lamk., Tab. Encycl. Meth. Bot. 1, 204 (1791).

Hemarthria fasciculata (Lamk.) Kunth, Rév. Gram. 1, 153 (1829).

Rottboellia compressa Linn. f. var. *fasciculata* (Lamk.) Hack. in DC., Monogr. Phan. 6, 286 (1889).

Manisuris altissima (Poir.) Hitchc. in J. Wash. Acad. Sci. 24, 292 (1934).

Distribution: Madras, Burma, Tropical Africa. $2n = 20$.

Exsicc.—*C. E. Parkinson* 15089A, Rangoon; *Herb. Rottl.*, Madras.

Hemisorghum C. E. Hubbard in
Appendix p. 687

1. **Hemisorghum mekongense** (A. Camus) C. E. Hubb. in Appendix p. 687.

Sorghum mekongense A. Camus in Lecomte, Fl. Gén. de l'Indo-Chine 7, 323 (1922).

Distribution: South Burma to Indo-China.

This is a very robust grass with a large panicle but it has been only occasionally collected.

Exsicc.—*Maung Po Khant* 13417, Mergui; *Griffith* 6825, Mergui.

Heteropholis C. E. Hubbard in Hook., Ic. Pl.
sub. tab. 3348 (1956).

1. **Heteropholis nigrescens** (Thw.) C. E. Hubbard in Hook., Ic. Pl. sub tab. 3548 (1956).

Rottboellia nigrescens Thw., Enum. Pl. Zeyl. 364 (1864).

Manisuris nigrescens (Thw.) O. Ktze., Rev. Gen. Pl. 2, 780 (1891).

Distribution: Ceylon, Central Province, at an altitude of 1300 m.

Exsicc.—*Thwaites* C.P. 867, Ceylon.

Heteropogon Pers., Syn. Pl. 2, 533 (1807).

Key to the species of *Heteropogon*

1. Annuals:—

2. Lower glume of the pedicelled spikelet with a row of glands down the centre
H. melanocarpus

2. Lower glume of the pedicelled spikelet devoid of glands:—

3. Lower glume of the sessile fertile spikelet with a deep groove on the dorsal surface
H. bellariensis

3. Lower glume of the sessile fertile spikelet without a median groove:—

4. Dwarf species, very slender; glumes of pedicelled spikelet glabrous; peduncle of the racemes smooth and glabrous
H. polystachyos

4. A tall species; glumes of the pedicelled spikelets armed with stiff hairs from tubercle-based bristles; peduncle of the racemes villous or puberulous
H. ritchiei

1. Perennials:—

5. A giant grass with smooth and glabrous racemes 10–15 cm long; lowest 12–15 pairs of spikelets homogamous; lower glume of the sessile fertile spikelet 8–9 mm long, covered with rufous hairs and with 2–3 longitudinal ridges and grooved between the ridges
H. triticeus

5. Not giant grasses; racemes not more than 6 cm long; lower glume of fertile spikelet not more than 7 mm long; lower 2–6 pairs of spikelets homogamous:—

6. Racemes more or less bristly-hairy; internodes in the centre of the culm very much more than 0.5 cm long and hence leaves not conspicuously distichous; lower glume of sessile spikelet 6–6.5 mm long, terete *H. contortus*

6. Racemes glabrous; internodes 0.5 cm long, hence leaves very conspicuously distichous, complicate, falcate in side view; lower glume of the sessile spikelet 6–6.5 mm long, with two shallow grooves on the back *H. fischerianus*

1. **Heteropogon bellariensis** (Hack.) C. E. C. Fischer in Gamble, Fl. Madras, 1744 (1934).

Andropogon bellariensis Hack. in Flora 68, 123 (1885).

Distribution: Madras State, Anantapur District on Gooty Fort Hill.

A rare grass, known only from the type collection.

Exsicc.—Herb. Wight. 2321.

✓ 2. **Heteropogon contortus** (Linn.) P. Beauv. ex Roem. et Schult., Syst. Veg. 2, 836 (1817).

Andropogon contortus Linn. Sp. Pl. ed. 1, 1045 (1753).

A. contortus var. *genuinus* Hack. sub-vars. *roxburghii* Hack. and *secundus* Hack. in DC., Monogr. Phan. 6, 586, 587 (1889).

Heteropogon hirtus Pers., Syn. Pl. 2, 533 (1807).

H. glaber Pers., loc. cit. 533.

H. hirsutus P. Beauv., Ess. Agrost. 134 (1812).

H. allioni (DC.) Roem. et Schult., Syst. Veg. 2, 835 (1817).

H. polystachyus Nees, Agrost. Bras. 364 (1829).

H. firmus J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 334 (1830).

H. hispidissimus Hochst. ex Steud., Syn. Pl. Glum. 1, 367 (1854).

H. hohenackeri Hochst. ex Miq., Anal. Bot. Ind. 2, 24 (1851).

H. roxburghii Arn. ex Nees in Nov. Act. Nat. Cur. 19, Suppl. 1, 183 (1843).

Andropogon allionii DC. in Lamk. et DC., Fl. Franç. 3, 97 (1805).

A. bellardii Bub. in Nuovo Giorn. Bot. Ital. 5, 317 (1873).

A. besukiensis Steud., loc. cit. 367.

Distribution: Widely distributed in the tropics, ascending in the Himalaya to 2000 m.

This extremely variable species is found on a wide variety of soils. Until an investigation into the status of this species and its varieties has been carried out, using the methods of modern experimental taxonomy, there seems little to be gained in maintaining the varieties set up by various authorities. This grass is highly esteemed as a fodder grass and it can also be made into hay, but when the awns form it is avoided by stock. Animals can be seriously injured by the sharp callus of the fruits which, aided by

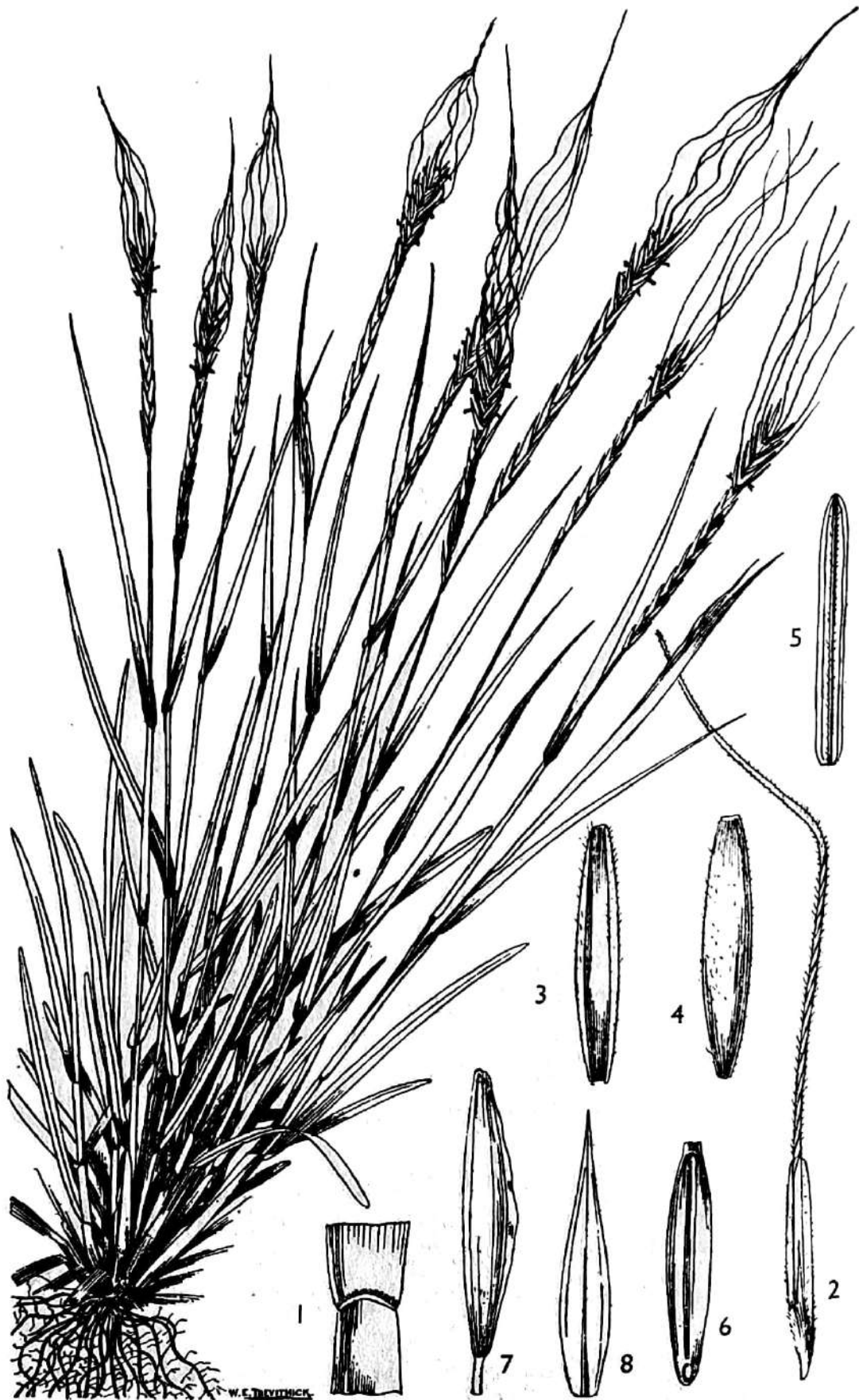


Fig. 6. *Heteropogon contortus* (Linn.) P. Beauv.
 Plant $\times \frac{1}{4}$; 1, ligule $\times 1$; 2, detached sessile spikelet $\times 4$; 3 and 4, its lower glume, front and back view; 5, its upper glume; 6, grain, showing hilum; 7, pedicelled spikelet; 8, its upper glume. 3-8, all $\times 5$.

Heteropogon insignis Thw., Enum. Pl. Zeyl. 437 (1864).

Distribution: South India, Bombay, Ceylon, South-east Asia to Australia.
A very stout species with formidable awns, sometimes gregarious on rocky hillsides.

Exsicc.—*Meebold* 8038, Burma; *Thwaites* C.P. 3804, Ceylon; *McCann* 9390, Bombay.

Hyparrhenia Anderss. in Nov. Act. Soc. Sci. Upsal. ser. 3, 2, 254 (1856)
nomen: ex Fourn., Mex. Pl. Gram. 51, 67 (1886) descr.

Key to the species of *Hyparrhenia*

1. Spikelets epinastically reflexed at maturity:—
 2. Bases of the racemes subtended by a scarious appendage; awned spikelets 2–4 per raceme-pair
H. bracteata
 2. Bases of the racemes without an appendage; awned spikelets 2–6 per raceme-pair:—
 3. Spatheoles permanently cymbiform, usually coloured a brilliant red or purple, 1.25–2 cm long
H. cymbaria
 3. Spatheoles very narrow acuminate, not cymbiform and not coloured, 3–4 cm long
H. griffithii
 1. Spikelets not epinastically reflexed at maturity:—
 4. Upper raceme with or without one pair of homogamous spikelets:—
 5. Hairs rufous or fulvous throughout; awned spikelets 7–13 per pair of racemes
H. rufa
 5. Hairs white throughout; awned spikelets 10–14 per raceme-pair
H. hirta
 4. Upper raceme with 2 pairs of homogamous spikelets; awned spikelets 2 per raceme-pair
H. filipendula
1. **Hyparrhenia bracteata** (*Humb. et Bonpl.*) *Stapf* in *Prain, Fl. Trop. Afr.* 9, 360 (1919).
Andropogon bracteatus *Humb. et Bonpl. ex Willd., Sp. Pl.* 4, 914 (1806).
A. trachypus *Trin. in Mém. Acad. Sci. Pétersb. sér.* 6, 2, 280 (1832).
Cymbopogon humboldtii *Spreng., Pugill.* 2, 15 (1815).
C. reflexus *Roem. et Schult., Syst. Veg.* 2, 834 (1817).
C. foliosus *Roem. et Schult., loc. cit.* 835.
Anthistiria reflexa (*Roem. et Schult.*) *H.B.K., Nov., Gen. et Sp.* 1, 191 (1816).
A. foliosa (*Roem. et Schult.*) *H.B.K. loc. cit.* 191.
A. humboldtii (*Spreng.*) *Nees, Agrost. Bras.* 369 (1829).
A. pilosa *J. S. Presl ex C. B. Presl, Rel. Haenk.* 1, 348 (1830).
A. andropogonoides *Steud., Syn. Pl. Glum.* 1, 402 (1855); name not in the index.
Sorghum bracteatum *O. Ktze., Rev. Gen. Pl.* 2, 791 (1891).



Fig. 7. *Hyparrhenia cymbaria* (Linn.) Stapf
 Plant $\times \frac{1}{2}$. 1, ligule; 2 and 3, sessile and pedicelled spikelets; 2a and 3a, joints of
 raceme; 2b and 3b, sessile spikelets; 2c and 3c, pedicelled spikelets; all $\times 5$

Sorghum rufum (Nees) O. Ktze., Rev. Gen. Pl. 2, 792 (1891).

Cymbopogon rufus (Nees) Rendle, Cat. Afr. Pl. Welw. 2, 155 (1899).

Distribution: Very common throughout Tropical Africa in moist situations, but introduced into many parts of South-east Asia, including India and Burma and also into South America.

In Africa it has an excellent reputation as a fodder for grazing animals, as, although it has a strong stem, grazing induces the production of a great deal of leaf. It can be used for silage and is also cut and fed to stock. $2n = 30, 40$.

Imperata Cyr., Pl. Rar. Neap. 2, 26 (1792) t. 11.

Key to the species and varieties of *Imperata*

1. Stamens 2; branches of the panicle not more than 2 cm long; panicle dense *I. cylindrica*
2. Panicle not more than, often very much less than, 20 cm long:—
 3. Spikelets 4.5–5.5 mm long; panicle extremely dense; leaves rolled, erect; nodes very rarely hairy *var. cylindrica*
 3. Spikelets 4–5 mm long; panicle often becoming loose; leaves flat and spreading; nodes hairy *var. major*
2. Panicle up to 60 cm long, 1.5–2.5 cm wide; leaves very broad (up to 2.8 cm wide) *var. latifolia*
1. Stamen 1; branches of the panicle up to 6 cm long *I. conferta*

1. **Imperata conferta** (J. S. Presl) Ohwi in Bot. Mag., Tokyo 55, 549 (1941).

Saccharum confertum J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 346 (1830).

Imperata ramosa Anderss. in Oefvers. K. Vet. Akad. Forh. Stockh. 158 (1855).

Distribution: South-east Asia.

Imperata exaltata (Roxb.) Brongn., Voy. Coq. Bot. 101 (1831), under which name this species appears in the *Flora of British India*, was based on *Saccharum exaltatum* Roxb., Fl. Ind. 1, 245 (1820), which to judge by the drawing in the *Icones Roxburghianae* is certainly a *Saccharum* and not an *Imperata*. It may well be *S. arundinaceum*.

Exsicc.—Hook. f. quotes Griffith, Mergui, but I have not seen this sheet. The plant is, however, common in Malaya and one would expect to find it in Burma.

✓ 2. **Imperata cylindrica** (Linn.) P. Beauv., Ess. Agrost. 165 (1812).

Lagurus cylindricus Linn., Syst. Nat. ed. 10, 878 (1759).

Saccharum cylindricum (Linn.) Lamk., Encycl. Meth. Bot. 1, 594 (1785).

S. laguroides Pourr. in Mém. Acad. Toulouse 3, 326 (1788).

Imperata arundinacea Cyr., Pl. Rar. Neap. 2, 26 (1792).

Calamagrostis lagurus Koel., Descr. Gram. 112 (1802).

var. *cylindrica*.

Imperata arundinacea var. *europaea* (Anderss.) Aschers. et Graebn., Syn. Mitteleurop. Fl. 2, 37 (1898).

Distribution: Mediterranean Region, extending to Iraq, Iran, Afghanistan and arid stretches of the U.S.S.R.

Exsicc.—Aitchison 306, Afghanistan; Griffith 359, Afghanistan. $2n = 20$.

var. *latifolia* (Hook. f.) C. E. Hubbard in Imp. Agri. Bur. Jt. Pub. no. 7, 14 (1944).

Imperata arundinacea var. *latifolia* Hook. f., Fl. Brit. Ind. 7, 106 (1896).

Distribution: Only found in swampy places in the Dehra Dun district. The chromosome number of this variety needs determination. This grass looks quite different from var. *major* in the field and may well be a distinct species.

Exsicc.—R. S. Hole, Dehra Dun; Strachey & Winterbottom 2, Kumaon; J. S. Gamble 23149, Dehra Dun.

var. *major* (Nees) C. E. Hubbard ex Hubb. et Vaughan, Grass. Maur. 96 (1940).

Saccharum koenigii Retz., Obs. Bot. 5, 16 (1789).

S. diandrum Koen. ex Retz., loc. cit. 16, nomen.

Imperata koenigii (Retz.) P. Beauv., Ess. Agrost. 165 (1812).

I. koenigii var. *major* Nees, Fl. Afr. Austr. 90 (1841).

I. allang Jungh. in Hœv. et De Vriese, Tijdschr. 7, 295 (1840).

I. pedicellata Steud. in Flora 29, 22 (1846).

I. filifolia Nees ex Steud., Syn. Pl. Glum. 1, 405 (1855).

I. cylindrica var. *koenigii* (Retz.) Dur. et Schinz, Consp. Flor. Afr. 5, 694 (1894).

Distribution: Warm and temperate parts of Asia, extending to Australia and East and South Africa.

This last-named variety covers very large areas, particularly in Bengal and Assam, where it is maintained by and flourishes in the annual fires which sweep over the large tracts of grassland. This species flowers just before the annual fires, and the light seeds enclosed in the glumes and lemmas and surrounded by the long silky hairs at the base of the glumes are borne aloft and carried to great distances by the strong winds which often blow at these times. Any bare areas such as slips in the hills, abandoned fields and such like, are immediately taken possession of. The white succulent rhizomes are very tenacious of life and a complete plant will grow from even a small piece, so that this grass is extremely difficult to eradicate. Such is the vigour of the grass once it has taken possession of the soil that plantations of trees are almost impossible to raise without numerous weedings. Once, however, a canopy is formed, the grass becomes depauperate and thins out. Experiments in the Philippines have shown that *Leucaena glauca*, a small leguminous tree, can grow on equal terms with *Imperata* and can in this way be used to prepare the way for a more valuable timber crop. The grass itself is an excellent thatching grass, can be made into paper, and is also relished by grazing animals after the annual

fires, when the young shoots appear. It is not much eaten when old.
 $2n = 20$.

Exsicc.—*Inayat* 20330, Hazara; *J. S. Gamble* 22377, Dehra Dun; *J. F. Duthie* 9960, Madhya Pradesh; *W. A. Talbot* 4963, Bombay; *Thwaites* C.P. 968, Ceylon; *Bourne* 1295, Madras.

Indochloa Bor in Kew Bull. 1954, 75 (1954).

Key to the species of *Indochloa*

1. Culm glabrous below the inflorescence; pedicelled and neuter spikelets reddish-brown when dry *I. clarkei*
1. Culm pilose below the inflorescence; pedicelled and neuter spikelets usually greenish *I. oligantha*

- ✓ 1. ***Indochloa clarkei*** (Hack.) Bor in Kew Bull. 1954, 76 (1954).
Andropogon clarkei Hack. in Öst. Bot. Z. 41, 49 (1891).
Dichanthium clarkei (Hack.) Haines, Bot. Bihar and Orissa 1040 (1924).
 Distribution: Parasnath Hill and Mt. Abu.
 Little is known of this grass.
 Exsicc.—*C. B. Clarke* 33780 (K), Parasnath.

- ✓ 2. ***Indochloa oligantha*** (Hochst.) Bor in Kew Bull. 1954, 79 (1954).
Andropogon oliganthus Hochst. ex Steud., Syn. Pl. Glum. 1, 368 (1854).
Heteropogon oliganthus (Hochst.) Blatt. et McCann in J. Bombay Nat. Hist. Soc. 32, 623 (1928).

Distribution: Madras State; Nilgiris, Bombay; Mahabaleshwar and Panchgani.

A very aromatic species, scenting the air all around on the Panchgani plateau in September and October (Blatter). The substance responsible for the scent must be very volatile as dried material of comparatively recent date is quite odourless.

- ✱ Exsicc.—*Hohenack*. 1288 (K).

Ischaemum Linn., Gen. Pl. ed. 5, 469 (1754) et in
 Sp. Pl. ed. 1, 1049 (1753).

Schoenanthus Adans., Fam. Pl. 2, 38 (1763).

Colladoa Cavan., Ic. Pl. 5, 37 (1799) t. 460.

Meoschium P. Beauv., Essai Agrost., 111 (1812).

Ischaemopogon Griseb., Flor. Brit. West. Ind. Isl. 560 (1864).

Key to the species and varieties of *Ischaemum*

1. Margins of the lower glume of the sessile spikelet expanded below the middle:—

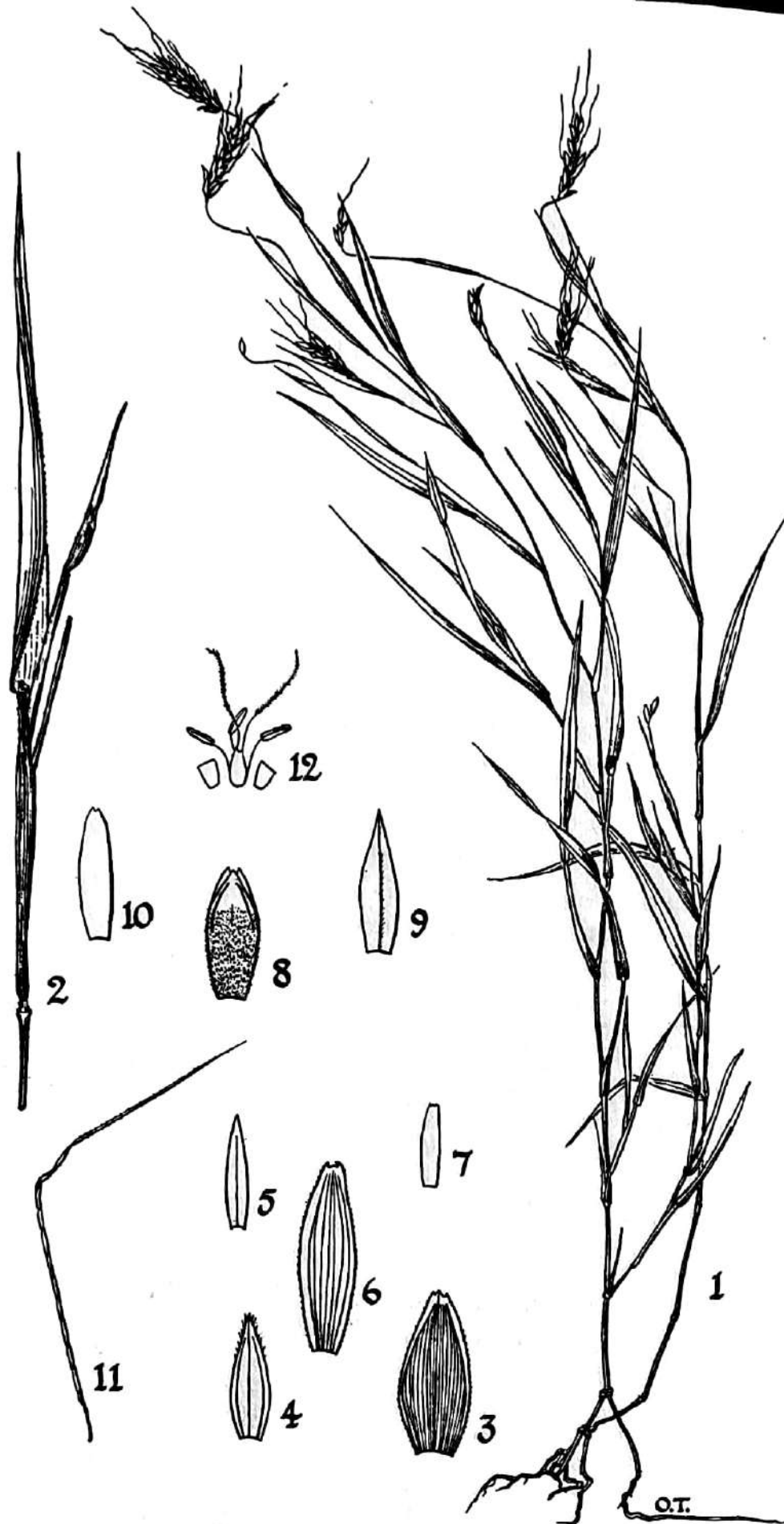


Fig. 8. *Indochloa clarkei* (Hack.) Bor
 1, plant $\times \frac{1}{4}$; 2, portion of the stem with leaves $\times 4$; 3, lower glume of the pedicelled spikelet; 4, upper glume of ditto; 5, upper glume of lowest neuter of hermaphrodite sessile spikelet; 6, lower glume of ditto; 7, empty lemma of ditto; 8, lower glume of sessile spikelet; 9, upper glume of ditto; 10, lower lemma; 11, stamens, ovary and lodicules; 12, upper lemma and awn. 3-12 all $\times 5$.

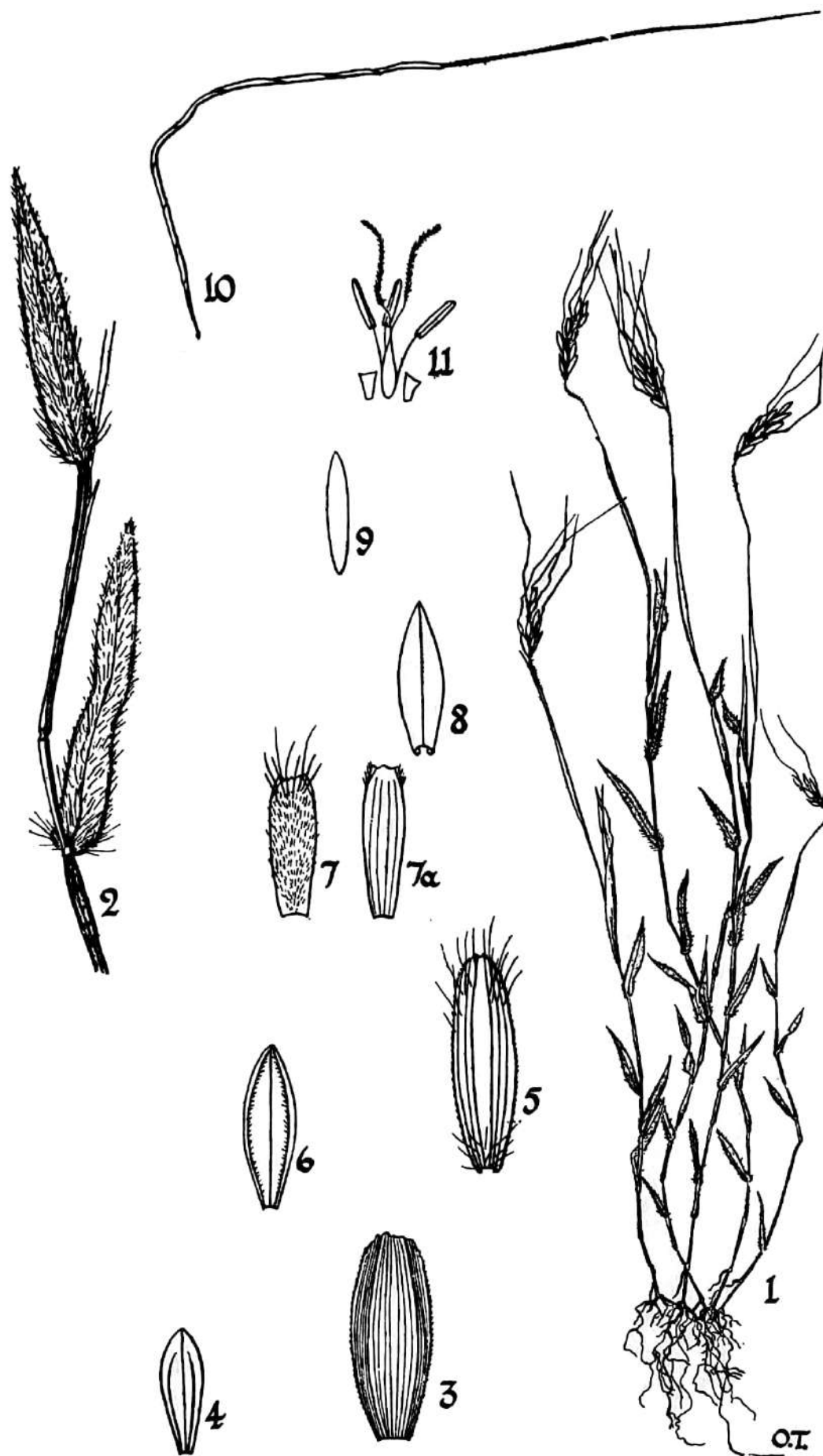


Fig. 9. *Indochloa oligantha* (Hochst.) Bor

1, plant $\times \frac{1}{2}$; 2, portion of the stem with leaves $\times 4$; 3, lower glume of the pedicelled spikelet; 4, upper glume of ditto; 5, lower glume of the lowest neuter sessile spikelet; 6, upper glume of ditto; 7 and 7a, lower glume of sessile hermaphrodite spikelet; 8, upper glume of ditto; 9, lower lemma; 10, upper lemma and awn; 11, stamens, ovary and lodicules. 3-11 all $\times 5$.

2. Keel of the upper glume of the sessile spikelet winged above the middle:—
 3. Spikelets unawned *I. muticum*
 3. Spikelets awned:—
 4. Lower glume of the sessile spikelet oblong-acuminate; keels rounded not winged; spikelets 5 mm long; a tuft of hair is present below the wing of the upper glume *I. thomsonianum*
 4. Lower glume of the sessile spikelet with broad or narrow wings in the upper half:—
 5. Wings broad, often auriculate; lower glume up to 6 mm long:—
 6. Sessile spikelet 5 mm long; callus large, glabrous; awn 4 mm long; upper glumes of both spikelets dorsally broad-winged; leaves and sheaths brown-villous *I. lisboae*
 6. Sessile spikelet 5–6 mm long; callus short, bearded; awn 12 mm long *I. indicum*
 7. Spikelets up to 5 mm long; pores* distinct:—
 8. Leaves glabrous, puberulous, hirtellous or appressed pubescent:—
 9. Leaves glabrous or puberulous:—
 10. Nerved portion of the lower glume of the sessile spikelet smooth var. *indicum*
 10. Nerved portion of the lower glume scrobiculate subvar. *scrobiculatum*
 9. Leaves appressed-pubescent subvar. *malacophyllum*
 8. Leaves and sheaths villous with erect hairs subvar. *villosum*
 7. Spikelets 5.5–6 mm long; pores indistinct:—
 11. Lower glume of the sessile spikelets long-pilose var. *wallichii*
 11. Lower glume of the sessile spikelet glabrous except for the callus; leaves very hairy var. *longipilum*
 5. Wings narrow; lower glume 6 mm long or longer:—
 12. Racemes very hairy; leaves tapering, almost petiolate at the base; sessile spikelets 6 mm long *I. lacei*
 12. Racemes glabrous; leaves rounded at the base; sessile spikelets 8–10 mm long *I. heterotrichum*
2. Keel of upper glume of the sessile spikelet not winged above the middle; sometimes wing obscure (*I. thomsonianum*):—
 13. Racemes 5–12, paniculate:—
 14. Lower lemma of the pedicelled spikelet acuminate or aristate; spikelets 5 mm long *I. duthiei*
 14. Lower lemma of the pedicelled spikelet not awned; spikelets 6–7 mm long *I. nilagiricum*

* A term applied to the shape of the aperture between the base of the spikelet and the joint of the rhachis—best seen on the adaxial surface of the raceme.

- 13. Racemes not more than 3, glabrous or hairy:—
 - 15. Lower glume of the sessile spikelet even in texture throughout, herbaceous-chartaceous; spikelets 6–7 mm long:—
 - 16. Lower glume of sessile spikelet hirsute in the upper half; leaves hairy *I. hirtum*
 - 16. Lower glume of sessile spikelet hairy on the margins only; leaves glabrous *I. rivale*
 - 15. Lower glume of the sessile spikelet subcoriaceous below, herbaceous above; spikelets not more than 5 mm long:—
 - 17. Perennials, with bearded nodes:—
 - 18. Wiry tufted plants sending out runners rooting at the nodes; upper glume of the sessile spikelet without a wing; base of plant hairy *I. flumineum*
 - 18. Straggling not tufted; upper glume of the sessile spikelet with an obscure papery wing; base of plant not hairy *I. thomsonianum*
 - 17. Annuals:—
 - 19. Lower leaves of the culms with a petiole 1 cm long *I. zeylanicolum*
 - 19. Lower leaves not petiolate:—
 - 20. Spikelets 2.5–3 mm long; apex of lower glume not bicuspidate *I. timorensis*
 - 20. Spikelets 5 mm long; apex of lower glume bicuspidate *I. thomsonianum*
- 1. Margins of the lower glume of the sessile spikelet narrowly and evenly inturned from base to apex:—
 - 21. Base of the lower leaves acute, tapering, rounded or shallowly cordate, without a petiole:—
 - 22. Pedicel of the pedicelled spikelet more than one-third the length of the sessile spikelet:—
 - 23. Perennial grasses:—
 - 24. Lower glume of the sessile spikelet oblong-obtuse, perfectly smooth and glabrous:—
 - 25. Upper glume without a hump in the middle of the dorsal surface:—
 - 26. Upper glume with a narrow wing below the tip; lower glume without nodules, 6–7 mm long; awn 20 mm long *I. hubbardi*
 - 26. Upper glume without a narrow wing below the tip, keeled; lower glume often with a few obscure nodules, 6 mm long; awns 12–15 mm long *I. commutatum*
 - 25. Upper glume with a hump in the centre of the dorsal surface *I. impressum*
 - 24. Lower glume of the sessile spikelet lanceolate or elliptic-lanceolate; dorsal surface pilose, flat or depressed *I. pilosum*
 - 23. Annual grasses; lower glume of the sessile spikelet with a

- bulge in the lower third:—
27. Lower glume of the sessile spikelet with two tufts of hairs on the margins about the middle *I. diplopogon*
27. Lower glume without such tufts of hair:—
28. Lower glume long-bicuspidate, about 9–10 mm long; upper glume with a tuft of hairs in the upper third, dorsally rounded, not humped and without a broad wing *I. kingii*
28. Lower glume muticous, about 7 mm long; upper glume without a tuft of hairs on the back; back rounded with a hump in the middle and an auricle-like wing above *I. impressum*
22. Pedicel of the pedicelled spikelet less than one-third of the length of the sessile spikelet:—
29. Sessile spikelets 8–11 mm long:—
30. Spikelets awned, 10–11 mm long *I. koenigii*
30. Spikelets unawned, 8–10 mm long *I. magnum*
29. Sessile spikelets not more than 7 mm long:—
31. Lower glume of sessile spikelet coriaceous with nodules on the rounded keels, sometimes the latter inconspicuous:—
32. Tip of the lower glume winged on one side; wing auriculate *I. mangaluricum*
32. Tip of the lower glume narrowly winged, if winged at all:—
33. Lower leaves tapering to the base:—
34. Perennials; racemes terminal to the culms; spikelets 5.5–7 mm long *I. barbatum* *I. goebelii*
34. Annuals; racemes in fascicles from the uppermost nodes; spikelets 4–7.5 mm long, oblong-obtuse or oblong-acute; culms stilt-rooted *I. santapau*
33. Lower leaves not tapering to the base, rounded or shallowly cordate:—
35. Lower glume of pedicelled spikelet with a very broad wing on one margin *I. travancorens*
35. Lower glume of pedicelled spikelet without a wing *I. tumidum*
31. Lower glume of sessile spikelet crustaceous with side nodules joined by sharp ridges, or chartaceous with very obscure nodules and ridges; lower glume shining, glabrous, yellow, or densely covered with white hairs:—
36. Ridges deep; lower glume glabrous on dorsal surface, or pilose; leaves tapering at base:—
37. Spikelets up to 6 mm long; rather slender plants *I. rugosum*
37. Spikelets 8–9 mm long; plants robust *I. bombaiense*
36. Ridges very shallow; dorsal surface of the lower glume often almost smooth and frequently densely covered with

white hairs; leaves shallowly cordate at the base; upper true leaf usually cordate with hairy pedicel and the lower with bases tapering or rounded; usually tall, robust, especially when from swamps *I. molle*

21. Base of the lower leaves sagittate or deeply cordate, nearly always with a distinct petiole (see *I. tumidum*):—

38. Pedicels of the pedicelled spikelet longer than one-third of the length of the spikelets:—

39. Lower glume with a boss in the lower third and two semi-lunar depressions above it; no nodules; annual; upper glume humped at the middle with an auricle-like wing above

I. impressum

39. Lower glume flat or slightly convex on the dorsal surface, with several more or less conspicuous nodules on the margins in the lower third or almost completely devoid of nodules; upper glume not humped in the middle and without an auricle-like wing above it; perennial

I. commutatum

38. Pedicels of the pedicelled spikelets one-third the length of the sessile spikelet or less:—

40. Lowest group of spikelets in threes, one sessile and two very shortly pedicelled

I. burmanicum

40. Lowest group of spikelets in pairs:—

41. Lower glume of the pedicelled spikelet very broadly winged on one margin

I. rangacharianum

41. Lower glume of pedicelled spikelet without a very broad wing:—

42. Joints of the racemes linear-clavate or slightly clavate-turbinate; lower glume of sessile and pedicelled spikelets deeply and irregularly wrinkled; lower spikelets often glabrous, upper hairy; or whole raceme hairy

I. dalzellii

42. Joints of the raceme distinctly turbinate; lower glumes not as above, laterally noded or nodules joined across dorsal surface as sharp ridges:—

43. Leaves not more than 6 cm long, ovate-acute or oblong-acute, cordate or truncate, but not sagittate at the base, not petioled

I. tumidum

43. Leaves 6–15 cm long, linear-lanceolate, acute or acuminate, often sagittate or deeply cordate at the base:—

44. Sessile and pedicelled spikelets very narrow in proportion to their length, $6-8 \times 1.5$ mm; pedicelled spikelet hardly pedicelled; nodules on the margins of the lower glumes interlocking and joined by distinct transverse ridges; lower glumes of the lower 3–5 pairs of spikelets glabrous; upper spikelets villous in the lower half

I. ritchiei

44. Sessile and pedicelled spikelets not so narrow, 6-7.5 × 2 mm, without interlocking nodules; nodules connected by bas-relief ridges:—

45. Racemes mostly without awns; sessile spikelets 6.5-7.5 mm long; leaves up to 15 cm long, 2 cm wide *I. huegelii*

45. Racemes awned; sessile spikelet 6 mm long; leaves up to 9 cm long, 1.5 cm wide; lower leaves long-petioled *I. goebelii*
I. semisagittatum

✓ 1. ***Ischaemum bombaiense*** Bor in J. Bombay Nat. Hist. Soc. 49, 165 (1950).

Distribution: Endemic in Bombay State.

It has been found near Tata's Lake, Khandala. The very much larger spikelets distinguish it from *I. rugosum*, for which it otherwise is likely to be mistaken.

Exsicc.—The type specimen is at Kew (*Blatter* 9904, Khandala).

2. ***Ischaemum burmanicum*** Bor in Kew Bull. 1949, 568 (1950).

Distribution: So far only found in the Golden Valley, Rangoon.

A very peculiar species in which the spikelets are in threes at the base of the racemes.

Exsicc.—The type specimen is at Kew (*U Thein Lwin* 627, Rangoon).

✓ 3. ***Ischaemum commutatum*** Hack. in DC., Monogr. Phan. 6, 209 (1889).

Distribution: Madras State, Ceylon, Bombay.

A very leafy species which is probably of use as a fodder plant.

Exsicc.—*Thwaites* C.P. 2625, Ceylon; *J. S. Gamble* 12020, Nilgiris; *Santapau* s.n., Khandala.

✓ 4. ***Ischaemum dalzellii*** Stapf ex Bor in Kew Bull. 1951, 448 (1952).

Distribution: North Kanara.

Little is known of this species. The lower leaves are long-petiolate and hastate at the base of the lamina.

Exsicc.—The type specimen is at Kew (*W. A. Talbot* 738, North Canara).

✓ 5. ***Ischaemum diplopogon*** Hook. f., Fl. Brit. Ind. 7, 129 (1896).

Distribution: Endemic in Bombay.

It has been collected on wet rocks in a stream near Mahableshtar.

Exsicc.—Type of *I. diplopogon* Hook. f. (K): *Woodrow* s.n., Bombay.

6. ***Ischaemum duthiei*** Stapf ex Bor in Kew Bull. 1950, 188 (1950).

Distribution: Madhya Pradesh, Bihar, Bengal, Kangra.

This species is said to grow beside streams.

Exsicc.—Type of *I. duthiei* Stapf (*H. H. Haines* 5856, Neterhat).

✓ 7. ***Ischaemum flumineum*** Bor in Kew Bull. 1949, 572 (1950).

Distribution: Madras State in the bed of Jog river.

var. **longipilum** (Hack.) Bor comb. nov.

I. ciliare Retz. var. *longipilum* Hack., loc. cit. 227.

Distribution: Ceylon.

Exsicc.—Thwaites C.P. 3167, Ceylon.

I. aristatum Linn. var. *barberi* C.E.C. Fischer in Gamble Fl. Madras 1722 (1934) is *I. lisboae* Hook. f.

This species merits a thorough investigation by the methods of modern experimental taxonomy. Until such an investigation is carried out the above arrangement of the varieties and subvarieties of Hackel may be followed. These taxa are not always distinct, emphasizing once again the need of a solution of this problem.

This species appears under the name *Ischaemum ciliare* Retz. in the Flora of British India following Hackel's treatment of *Ischaemum* in DC., *Monogr. Phan.* 6, 225 (1889). Dr. Stapf, however, after an examination of the material of *Ischaemum aristatum* Linn. in the Linnean Herbarium in London, came to the conclusion that *I. ciliare* Retz. was a synonym of *I. aristatum* Linn. This conclusion has been accepted until recently, when my colleague, C. E. Hubbard, taking advantage of a relaxation of the rule that Linnean types were not to be removed from the rooms of the Linnean Society, was able to compare the Linnean types with the very rich material at Kew. This has enabled him to come to a different conclusion which follows and with which I am in complete agreement.

In *Species Plantarum* ed. 1, 1049 (1753) Linnaeus described an awned species of *Ischaemum* which he called *Ischaemum aristatum* Linn., specimens of which were collected in China by Osbeck "Habitat in China, Osbeck". He states that in the structure of the spike and flower it is like the preceding species, *I. muticum* Linn., but has taller culms, large spike, naked peduncle of the spike and an awned "seed".

There are two sheets in the Linnean Herbarium. The first of these, 1214.2, is labelled at the foot of the sheet in the hand of Linnaeus "2. aristatum". The second sheet, 1214.3, is labelled at the foot of the sheet, likewise in the hand of Linnaeus, "*Ischaemum aristatum*".

Of these two there is no doubt that 1214.2 should be considered the type since it agrees best with the Linnean description, e.g. it is taller and has a longer spike than his specimen of *I. muticum*. Sheet 1214.3, on the other hand, has a single small specimen, not so large as, and with a much smaller spike than, *I. muticum*. This plant is referable to *Ischaemum indicum* (*I. ciliare* Retz.) the Indian plant.

The first of these sheets, i.e. the type of true *Ischaemum aristatum* Linn., does not agree with any specimens of the very large mass of material at Kew, a great deal of it from India and Burma, which is in the covers of *Ischaemum aristatum* sensu Stapf. It differs from the latter in having glabrous nodes, an entire tip to the lower glume of the sessile spikelet, a shorter awn (less than 10 mm long) with the column scarcely exerted from the spikelet and by the awnless or very shortly awned pedicelled spikelets. Using the

key to the species of *Andropogon* in Hackel's *Monograph of the Andropogoneae*, the species runs down to *Ischaemum sieboldii* Miq. [*I. crassipes* (Steud.) Thell.]. The Linnean specimen does not agree with typical awnless material of this variable eastern Asiatic species in the Kew Herbarium. There are, however, a few sheets with awned spikelets and winged lower glumes from Japan (*Savatier* 1514) and Fukien (*Price* 1343) which it closely resembles. These are probably referable to *Ischaemum crassipes* Nakai ex Honda. in J. Fac. Sci. Tokyo Univ., sect. III, Bot. 3, pt. 1, 354 (1930).

✓ 15. ***Ischaemum kingii* Hook. f.**, Fl. Brit. Ind. 7, 129 (1896).

Distribution: This species seems to be confined to the Panchgani plateau, Mt. Abu.

Exsicc.—Type of *I. kingii* Hook. f. (K): *King* s.n., Bombay.

16. ***Ischaemum koenigii* (Hook. f.) Stapf ex C. E. C. Fischer** in Gamble, Fl. Madras, pt. 10, 1722 (1934).

I. aristatum Hook. f. non Linn., subsp. *koenigii* Hook. f., Fl. Brit. Ind. 7, 127 (1896).

I. fasciculatum Rottl. ex Hook. f., loc. cit. 127 in synonymy.

Distribution: Madras State.

This is a very robust species with large spikelets, very reminiscent of *I. magnum* except that the spikelets are awned.

Exsicc.—Type at Kew (*Herb. Rottler* s.n., Madras).

17. ***Ischaemum lacei* Stapf ex Bor** in Kew Bull. 1950, 187 (1950).

Distribution: Burma (Amherst District; Mogok).

A very fine species which seems to be endemic in Burma.

Exsicc.—Type at Kew (*J. H. Lace* 5627, Burma).

✓ 18. ***Ischaemum lisboae* Hook. f.**, Fl. Brit. Ind. 7, 133 (1896).

I. aristatum var. *barberi* C. E. C. Fisch. in Gamble, Fl. Madras 1722 (1934).

Distribution: Bombay and Madras States.

This interesting plant has been collected on two occasions only, namely, in North and South Kanara.

Exsicc.—Type of *I. lisboae* Hook. f. (*Lisboa* s.n., North Canara).

19. ***Ischaemum magnum* Rendle** in J. Bot., 32, 102 (1894).

Distribution: Malay Peninsula and most probably in Burma.

This is a very robust species reaching a height of 2 m, the spikelets are unawned.

Exsicc.—Type at Kew (*Fielding* s.n., Malaya).

✓ 20. ***Ischaemum mangaluricum* (Hack.) Stapf ex C. E. C. Fischer** in Gamble, Fl. Madras, 1723 (1934).

I. geniculatum Hochst. in Hohenack., Pl. Ind. Or. no. 184 (1847).

I. aristatum (Hack. non Linn.) subsp. *imberbe* var. *mangaluricum* Hack. in DC., Monogr. Phan. 6, 204 (1889).

Distribution: Plains and hills of India and Ceylon up to 1500 m, extending into the Malayan Islands.

A very common and variable grass in damp wayside places, which is certainly acceptable to cattle. Of the varieties mentioned by Hackel in DC., *Monogr. Phan.* 6, 230-1 (1889) var. *zeylanicum* was considered by Dr. Stapf to be a distinct species, and that view is adhered to in this book. The variety var. *villosa* C. E. C. Fischer [in Gamble, *Fl. Madras* 1722 (1934)] is an extreme pilose state.

Exsicc.—*J. S. Gamble* 15586, Nilgiris; *J. H. Lace* 5008, Burma; *Meebold* 10778, Mangalore (var. *villosa*). $2n = 36$.

33. ***Ischaemum travancorense* Stapf ex C. E. C. Fischer** in Kew Bull. 1933, 353 (1933).

I. aristatum (non Linn.) subsp. *rottleri* Hook. f., *Fl. Brit. Ind.* 7, 127 (1896).

Distribution: Travancore.

The type is in the Kew Herbarium (*M. A. Lawson* 130, Travancore).

✓ 34. ***Ischaemum tumidum* Stapf ex Bor** in Kew Bull. 1951, 450 (1952).

Distribution: Madras State, Bombay State.

This seems to be distinct with swollen raceme joints and small leaves.

The type specimen is at Kew. (*Stocks* s.n., Concan.)

✓ 35. ***Ischaemum zeylanicum* Bor**, nom. et stat. nov., *I. timorensi* affine sed ab ea laminis inferioribus longe petiolatis distinguitur.

I. timorensis var. *zeylanicum* Hack. in DC., *Monogr. Phan.* 6, 230 (1889).

Distribution: Ceylon, Bombay.

This species was separated as distinct by Dr. Stapf in the Kew Herbarium on account of the lower leaves being long-petiolate. It has, in addition, smaller spikelets than *I. timorensis*.

Exsicc.—*Alston* 1098, Kandy; *Thwaites* C.P. 963, Ceylon.

Stapf in MSS. had raised the variety of Hackel to specific rank, but the epithet *zeylanicum* cannot be used because of Hackel's *I. zeylanicum* = *Eremochloa zeylanica* Hack.

***Ischnochloa* Hook. f.** in Hook. *Ic. Pl.* t. 2466 (1896).

1. ***Ischnochloa falconeri* Hook. f.**, loc. cit. (1896).

Distribution: North-west Himalaya.

This delicate species seems to have a very restricted range, viz. from Mussoorie to Simla, where it is found growing in moss between 1800 and 2100 m. The spikelets resemble those of species of *Microstegium*, but the rhachis is flat and tough and both the spikelets hermaphrodite. It also resembles *Arthraxon lancifolius* in habit and appearance, and actually grows with the latter, but its structure is very different from that of *Arthraxon*.

Exsicc.—Type at Kew; *J. S. Gamble* 27208, Mussoorie.

Iseilema Anderss. in Nov. Act. Soc. Sci. Upsal.
ser. 3, 2, 250 (1856).

Key to the species of *Iseilema*

1. Tubercles not present on the spatheoles or spikelets; nodes, at least the lower, glabrous:—
 2. Pedicels of involucrel spikelets as broad as long, hairy on the margin; lower glumes of the hermaphrodite spikelets humped or convex below, appressed-hairy at the base or glabrescent and ciliate on the margins in the lower quarter; beak as long as the lower elliptic portion; involucrel spikelets 4.5–6.5 mm long, long-ciliate on the margins *I. anthephoroides*
 2. Pedicels of involucrel spikelets longer than they are broad at the apex; lower glume of hermaphrodite spikelet glabrous at the base, appressed-hairy above and eciliate on the margin below; beak not as long as lower elliptic portion; hermaphrodite spikelet 4–6 mm long; involucrel spikelets 4 mm long *I. laxum*
1. Tubercles present on the spatheoles and/or on the margins of the involucrel spikelets:—
 3. Lower glume of hermaphrodite spikelet convexly humped, appressed-hairy at the base and ciliate on the margins in the basal quarter; beak as long as the lower elliptic portion; nodes glabrous; involucrel spikelet 4.5–6.5 mm long, broadly oblong, acute or acuminate *I. anthephoroides*
 3. Lower glume of hermaphrodite spikelet flat or depressed longitudinally, glabrous and eciliate in the lower quarter; nodes bearded; beak shorter than spikelet proper:—
 4. Pedicels slender, much longer than broad; hermaphrodite spikelet 3–5 mm long:—
 5. Clusters of spikelets in dense fascicles; a robust species 60–120 cm tall; hermaphrodite spikelets longer (5.5–6.5 mm) than the involucrel which are 4–4.5 mm long *I. holei*
 5. Clusters of spikelets not in dense fascicles; a slender grass; hermaphrodite spikelets about as long as the involucrel which are 3.5–4.5 mm long *I. prostratum*
 4. Pedicels stout, not much longer than they are broad at the tip, often only as long as they are broad; hermaphrodite spikelets 6–8 mm long; involucrel spikelets 5.5 mm long *I. argutum*

✓ 2. ***Iseilema anthephoroides*** Hack. in DC., Monogr. Phan. 6, 683 (1889).

Distribution: South India, Bombay State.

The hermaphrodite spikelet is not subsessile as stated in the *Flora of British India*, but is seated on a stipe 0.5 mm long. On the lower glume of the involucrel spikelets the number of well-marked ribs is not always

pogon prostratus and therefore *I. wightii* appears in the synonymy of *I. prostratum*.

Lasiurus Boiss., Diagn. Pl. Nov. Or. sér. 2, 4, 145 (1859).

Key to the species of *Lasiurus*

1. Culms very densely hirsute below the inflorescence; lower glume of the centre spikelet including the tail 12 mm long; joint of inflorescence 5.5 mm long by 3.5 mm wide at top *L. indicus*
1. Culms glabrous below the inflorescence; lower glumes 8 mm long; joint of inflorescence 7 mm long by 1.75 mm wide *L. hirsutus*

1. **Lasiurus hirsutus** (Forssk.) Boiss., Diagn. Pl. Orient. sér. 2, 4, 146 (1859), based on *Rottboellia hirsuta* Vahl.

Saccharum hirsutum Forssk., Fl. Aegypt.-Arab. 16 (1775).

Triticum aegilopoides Forssk., loc. cit. 26.

Rottboellia hirsuta Vahl, Sym. Bot. 1, 11 (1790).

Coelorhachis hirsuta Brongn. in Duperr., Voy. Coq. Bot. 65 (1831).

Ischaemum mastrucatum Trin. in Mém. Acad. Sci. Pétersb., sér. 6, 2, 298 (1832).

I. hirsutum Nees ex Steud., Syn. Pl. Glum. 361 (1854).

Elyonurus hirsutus (Vahl) Munro ex Benth. in J. Linn. Soc. (Bot.) 19, 68 (1881).

Distribution: Northwest India, extending to Arabia, Abyssinia, Egypt, Somaliland.

Usually to be found growing in large bushy thickets in sandy deserts. It is considered to be a good desert fodder.

Exsicc.—*Jacquemont* 349, Jelalapur; *J. F. Duthie* 20700, Hissar.

The nomenclature of this plant is one of those difficulties which arise from time to time to plague the taxonomist. Forsskal described this very plant under two names, *Triticum aegilopoides* and *Saccharum hirsutum*. Vahl transferred the same plant to *Rottboellia* as *Rottboellia hirsuta*, but instead of basing it on *Saccharum hirsutum* he quoted the other name, *Triticum aegilopoides*, as a synonym, while the former name is not mentioned at all. *Rottboellia hirsuta* is therefore an invalid name. When Boissier transferred the species to the genus *Lasiurus* he based it on *Rottboellia hirsuta* of Vahl, an invalid name. It seems ridiculous to give this species a new name because Vahl made a slip, particularly as the same epithet exists in the first name given to the plant by Forsskal, namely *Saccharum hirsutum*, and I propose to retain the latter epithet.

2. **Lasiurus indicus** Henr. in Blumea 4, 514 (1941).

Distribution: North-west India.

Found in similar places to the above species.

Exsicc.—*Stocks* s.n., Sind. It is a valuable fodder and is relished by camels, cattle and sheep.

Lophopogon Hack. in Engl. et Prantl, die Natürl. Pflanzenf. 2, 2, 26 (1887).

Key to the species of *Lophopogon*

1. Lower glumes of the lowest spikelets closely nerved, with tufts of hair at the sides *L. kingii*

1. Lower glumes of the lower spikelets devoid of hairs:—

2. Culms simple

L. tridentatus

2. Culms branched

L. duthiei

1. **Lophopogon duthiei** Stapf mss. sp. nov., in Appendix, p. 689.

Distribution: Madhya Pradesh.

One collection only.

Exsicc.—J. F. Duthie 8490 (K).

2. **Lophopogon kingii** Hook. f., Fl. Brit. Ind. 7, 149 (1896).

Distribution: Bihar, Monghyr.

This species has been collected on one occasion only.

Exsicc.—Mokim 1408, Bihar.

- ✓ 3. **Lophopogon tridentatus** (Roxb.) Hack. in Engl. et Prantl, Natürl. Pflanzenf. 2, 2, 26 (1887).

Andropogon tridentatus Roxb., Fl. Ind. 1, 261 (1820).

Saccharum tridentatum (Roxb.) Spreng., Syst. Veg. 1, 283 (1825).

Apocypis tridentata (Roxb.) Benth. in J. Linn. Soc. (Bot.) 19, 67 (1881).

Distribution: Madras State, Bombay, Madhya Pradesh.

Stated by Blatter to be common locally in Bombay State, particularly on arid gravelly uplands. The base of the plant is sometimes covered with a pale yellow wool.

Exsicc.—Madras Herb. 16433 (K).

Manisuris Linn., Mant. Pl. Alt. 164 (1771).

Peltophorus Desv.

ex P. Beauv., Essai Agrost., 119 (1812) t. 21, fig. 11.

Key to the species and varieties of *Manisuris*

1. Lower glume of sessile spikelets not awned:—

2. Lower glume of sessile spikelet umbonate, ovate-obtuse, winged on both sides above the middle *M. clarkei*

2. Lower glume with a deep transverse groove, oblong-acute; winged on both sides above and below the groove *M. myuros*

1. Lower glume of the sessile spikelets with one awn or two divaricate awns:—

3. Lower glume with two divaricate awns:—

4. Awns long; lower glume decorated with transverse rows of exaggerated tubercles or hooks, the latter sometimes bearded at the tips
M. forficulata var. *forficulata*
4. Awns short, not much longer than the wings; surface of the lower glume without tubercles or hooks, softly hirsute with white hairs
M. forficulata var. *hirsuta*
3. Lower glume of sessile spikelet with one well-developed awn or the awn reduced to a mucro, equally or unequally winged towards the tip; surface with transverse rows of tubercles or hooks or well-developed ridges:—
5. Joints of the raceme clavate, several times as long as broad:—
6. Lower glume of the sessile spikelet long-awned; surface of the lower glume with well-developed transverse ridges
M. acuminata var. *acuminata*
6. Lower glume of the sessile spikelet short-awned or awnless; surface with well-marked tubercular ridges, honeycombed between
M. acuminata var. *woodrowii*.
5. Joints of the racemes turbinate; lower glume of the sessile spikelet broadly winged on one side, narrowly on the other or equally winged; surface of glume with or without 3 upwardly directed ridges
M. talbotii

✓ 1. **Manisuris acuminata** (Hack.) O. Ktze., Rev. Gen. Pl. 2, 779 (1891).

Rottboellia acuminata Hack. in DC., Monogr. Phan. 6, 291 (1889).

Peltophorus acuminatus (Hack.) A. Camus in Bull. Mus. Hist. Nat. Paris, 27, 371 (1921).

Distribution: Bombay, Madras.

A rather variable annual found in rocky places.

var. **acuminata**.

Exsicc.—*Sedgwick et Bell* 7232, Jog; *Meebold* 10749, Mysore.

var. **woodrowii** Bor, var. nov. a varietate *acuminata* spiculis vix aristatis recedit.

Exsicc.—*R. K. Bhide* s.n., Bombay.

✓ 2. **Manisuris clarkei** (Hack.) Bor apud Santapau, Fl. Khandala 357 (1953).

Rottboellia clarkei Hack. in Öst. Bot. Z. 41, 8 (1891).

R. gibbosa Hack. ex Lisboa in J. Bombay Nat. Hist. Soc. 6, 194 (1891).

Coelorhachis clarkei (Hack.) Blatt. et McCann in J. Bombay Nat. Hist. Soc. 32, 33 (1927).

Distribution: Bombay, Madras, Coorg, Central India.

A strange species which has been doubtfully included in this genus. It certainly is not a *Rottboellia* nor a *Coelorhachis* as understood by modern agrostologists. It is a common annual in Bombay.

Exsicc.—*W. A. Talbot* 2072, North Kanara; *Sedgwick* 7990, Khandala, Bombay.

- ✓ 3. **Manisuris forficulata** C. E. C. Fischer in Kew Bull. 1933, 355 (1933).
Rottboellia divergens of Fl. Brit. Ind. 7, 155 (1896) non Hack. in DC.,
 Monogr. Phan. 6, 292 (1889).

Distribution: Bombay, Madras.

var. **forficulata**.

Exsicc.—*Meebold* 10558, Castle Rock, Bombay; *Meebold* 13331, Cochin.

var. **hirsuta** C. E. C. Fischer in loc. cit. 357.

Distribution: South India.

This variety is known from one gathering only.

Exsicc.—*Meebold* 10559, Madras.

4. **Manisuris myuros** Linn., Mant. 2, 300 (1771).

Peltophorus myurus P. Beauv., Ess. Agrost. 119, 167 (1812) t. 21, f. 11.

Rottboellia myurus (Linn.) Benth. in J. Linn. Soc. (Bot.) 19, 68 (1881).

Distribution: Endemic in Madras State.

Exsicc.—C. A. Barber 657, Madras; C. E. C. Fischer 4785, Chingleput;
 Bourne 1940, Madras.

- ✓ 5. **Manisuris talbotii** (Hook. f.) Bor, comb. nov.

Rottboellia talboti Hook. f., Fl. Brit. Ind. 7, 155 (1896).

Peltophorus talboti (Hook. f.) A. Camus in Bull. Mus. Hist. Nat. Paris
 27, 371 (1921).

Distribution: Goa District, Bombay, endemic.

Exsicc.—W. A. Talbot 2572, Goa.

Microstegium Nees in Lindley, Nat. Syst. ed. 2, 447 (1836).

Leptatherum Nees in Proc. Linn. Soc. 1, 92 (1841).

Nemastachys Steud., Syn. Pl. Glum. 1, 357 (1854).

Key to the species of *Microstegium*

1. Upper lemma well developed, split to the middle into two long, glabrous, triangular lobes *M. petiolare*
1. Upper lemma small, very shortly 2-lobed or entire, 1–2 mm long:—
 2. Anthers very small, 0.3–0.5 mm long; spikelets usually awnless; lower glume 4.5–6 mm long with prominently anastomosing veins *M. vimineum*
 2. Anthers much larger:—
 3. Racemes thickly covered and spikelets almost obscured by fulvous-brown hairs, supported at the base by a number of glabrous, imperfect spikelets; pedicelled spikelets very small *M. stapfii*
 3. Racemes and pedicelled spikelets not as above:—
 4. Anthers 3; racemes not usually spreading at right angles; upper lemma minute:—
 5. Joints of the racemes and pedicels inflated-clavate, hollow *M. eucnemis*

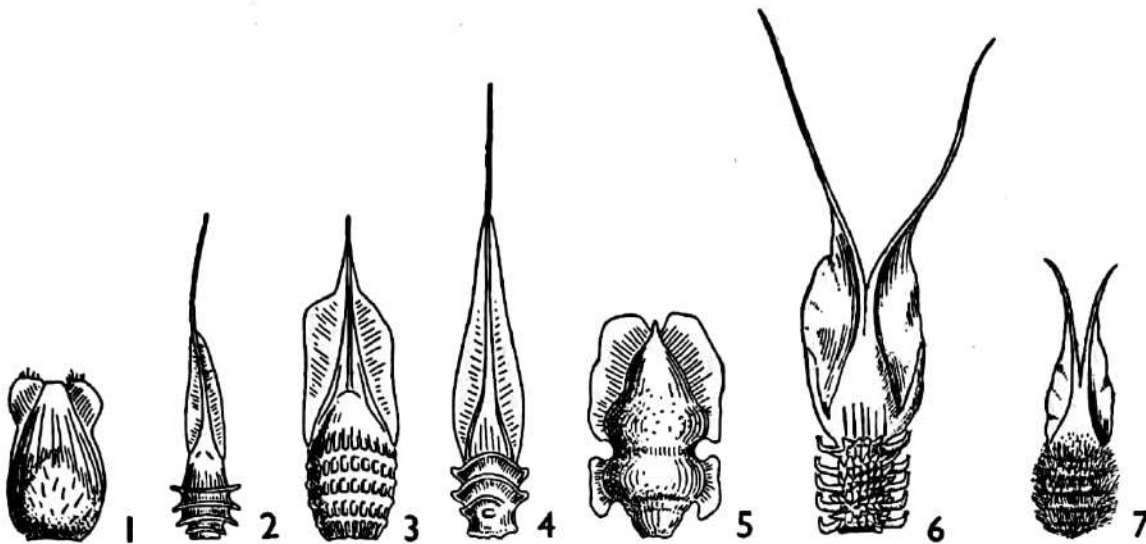


Fig. 10. Lower glumes of sessile spikelets of *Manisuris* Linn.

1, *M. clarkei* (Hack.) Bor; 2, *M. acuminata* (Hack.) O. Ktze.; 3, *M. acuminata* var. *woodrowii* Bor; 4, *M. talbotii* (Hook. f.) Bor; 5, *M. myuros* Linn.; 6, *M. forficulata* C. E. C. Fisch.; 7, *M. forficulata* var. *hirsuta* C. E. C. Fisch. 1, 3, 5 \times 6; 2, 4, 6, 7 \times 3. (1–5, P. Taylor; 6–7, Miss Ross-Craig.)

5. Joints of the racemes linear or at most slightly dilated upwards:—

6. Spikelets 3–4.5 mm long:—

7. Anthers 2–2.5 mm long; spikelets 3–4 mm long, purplish; nodes glabrous or hairy; lower glumes oblong or obovate-oblong *M. vagans*

7. Anthers 1–1.8 mm long; spikelets 3–3.5 mm long, pale; nodes glabrous; lower glume lanceolate to lanceolate-oblong *M. ciliatum*

6. Spikelets 2–2.5 mm long *M. delicatulum*

4. Anthers 2; racemes 4.5–10 cm long, not digitate, spaced at right angles on the rhachis; upper lemma 1–2 mm long *M. nudum*

1. ***Microstegium ciliatum*** (Trin.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 201 (1921).

Pollinia ciliata Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 306 (1832).

P. lancea Nees ex Steud., Syn. Pl. Glum. 1, 410 (1855).

P. laxa Nees ex Steud., loc. cit. 410.

P. wallichiana Nees ex Steud., loc. cit. 410 (1855).

P. monantha Nees ex Steud., loc. cit. 410.

Andropogon biaristatus Steud., loc. cit. 379 (1854).

Eulalia monantha (Nees) O. Ktze., Rev. Gen. Pl. 2, 775 (1891).

E. ciliata (Trin.) O. Ktze., loc. cit. 775.

Microstegium monanthum (Nees ex Steud.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 200 (1921).

M. biaristatum (Steud.) Keng in Sinensia 3, 92 (1932).

Distribution: Hills of India and Burma from 200–1820 m.

This species grows gregariously, particularly in sal forests, and sufficiently dense to stifle recruitment. Buffaloes will eat it but neither they

Distribution: Burma. Collected on the low sandstone hills opposite Akyab.

Little is known of this species.

Exsicc.—Type at Kew (*Kurz* s.n., Burma).

7. ***Microstegium vagans*** (Nees ex Steud.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 200 (1921).

Pollinia vagans Nees ex Steud., Syn. Pl. Glum. 1, 410 (1855).

P. montana Nees ex Steud., loc. cit. 409.

Ephebopogon gratus Nees et Meyen ex Steud., Nom. ed. 2, 1,556 (1840).

Pollinia grata Hack. in DC., Monogr. Phan. 6, 175 (1889).

Eulalia vagans (Nees) O. Ktze., Rev. Gen. Pl. 2, 775 (1891).

Microstegium gratum (Hack.) A. Camus in loc. cit. 201.

Distribution: North-eastern India and Burma.

Exsicc.—Wallich 8807B, Nepal; Kingdon-Ward 22874, Burma.

8. ***Microstegium vimineum*** (Trin.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 201 (1921).

Andropogon vimineus Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 268 (1832).

Microstegium willdenowianum Nees in Lindl., Nat. Syst. Bot. (ed. 2 of his Introd. Bot.) 447 (1836).

Pollinia imberbis Nees ex Steud., Syn. Pl. Glum. 1, 410 (1855).

P. willdenowiana (Nees) Benth. in J. Linn. Soc. (Bot.) 19, 67 (1881).

Eulalia viminea (Trin.) O. Ktze., Rev. Gen. Pl. 2, 775 (1891).

Pollinia viminea (Trin.) Merr., Enum. Philipp. Pl. 1, 35 (1923).

Distribution: North-eastern India to South-east Asia, China and Japan.

The variety called *genuina* by Hack. should presumably be now called *vimineum*; it has the sessile spikelets awned. The variety with awnless spikelets is known as var. *willdenowianum*.

Professor Ohwi, *in litt.*, informs me that in Japan *M. vimineum* has two kinds of spikelets, one chasmogamic with linear anthers and the other cleistogamic with minute anthers.

Exsicc.—N. L. Bor 18130, Khasi Hills.

Miscanthus Anderss. in Oefvers. Kon. Vet-Akad.

Förh. 165 (1855).

Xiphagrostis Coville in Contrib.

Unit. Stat. Nat. Herb. 9, 399 (1905).

Key to the species of *Miscanthus*

1. Hairs of the callus much longer than the spikelets; the latter 2–2.5 mm long *M. nepalensis*
1. Hairs of the callus about as long as the spikelets; the latter 4.5–5.5 mm long:—

2. Lower glume of the long-pedicelled spikelet acute, equal to the upper glume, that of the short-pedicelled spikelet truncate, shorter than the upper glume, both conspicuously 2-keeled; hairs mauve
M. taylorii
 2. Lower glumes of the long-pedicelled and short-pedicelled spikelets both shorter than the upper glumes:—
M. nudipes
 3. Spikelets shorter than the joints of the rhachis; both glumes pilose
M. wardii
 3. Spikelets equal to or longer than the rhachis joints; both glumes glabrous
1. **Miscanthus nepalensis** (Trin.) Hack. in DC., Monogr. Phan. 6, 104 (1889).
Eulalia nepalensis Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 333 (1832).
Distribution: All along the Himalaya, Khasi and Naga Hills, Burma.
A very handsome grass which could with advantage be grown for ornament.
Exsicc.—Wallich 8848, Nepal; N. L. Bor s.n., Naga Hills.
 2. **Miscanthus nudipes** (Griseb.) Hack. in DC., Monogr. Phan. 6, 109 (1889).
Erianthus nudipes Griseb. in Nachr. Koen. Akad. Wiss. Goett. 92 (1868).
Distribution: Sikkim, Bhutan.
A very handsome grass growing at high altitudes.
Exsicc.—B. J. Gould 522; Bor and Kirat Ram 20316, Sikkim.
 3. **Miscanthus taylorii** Bor in Kew Bull. 1953, 273 (1953).
Distribution: Tibet and likely in Sikkim.
Grows in open swampy meadow.
Exsicc.—Ludlow, Sherriff and Taylor 5799 (BM), Tibet.
 4. **Miscanthus wardii** Bor in Kew Bull. 1953, 274 (1953).
Distribution: Lohit Valley, Assam.
Forms large tufts on the banks of streams in full sunlight.
Exsicc.—Kingdon-Ward 20095, Lohit Valley.

Mnesithea Kunth, Rév. Gram. 1, 153 (1829).

Diperium Desv., Opusc. 76 (1831).

Thyridostachyum Nees in Lindl., Nat. Syst. ed. 2, 379 (1836) nomen.

Key to the species of *Mnesithea*

1. Lower glume of the sessile spikelet oblong with a rounded obtuse slightly oblique apex; not winged at the tip; leaves narrow, not more than 4 mm wide; pedicelled spikelets suppressed
M. laevis

1. Lower glume oblong, oblique and winged at the apex; leaves up to 2.5 cm broad, usually not less than 10 mm; pedicelled spikelet present but only as a rudiment seated on a free narrow pedicel *M. merguensis*

1. ***Mnesithea laevis* (Retz.) Kunth**, Rév. Gram. **1**, 154 (1829).

Rottboellia laevis Retz., Obs. Bot. **3**, 11 (1783).

R. perforata Roxb., Pl. Corom. **2**, 43 (1798) t. 182.

Ophiurus perforatus Trin. in Mém. Acad. Sci. Pétersb. sér. 6, **2**, 246 (1832).

O. laevis (Retz.) Benth. in J. Linn. Soc. (Bot.) **19**, 69 (1881).

Diperium cylindricum Desv., Opusc. 76 (1831) t. 6, f.3.

Thyridostachyum laeve (Retz.) Nees in Lindl., Introd. Nat. Syst. ed. 2, 379 (1836).

Distribution: India, Burma, Ceylon, Malay Islands, Indo-China.

Exsicc.—Wight 1722 (type); R. R. Stewart 21364, Mussoorie.

2. ***Mnesithea merguensis* (Hook. f.) A. Camus** in Bull. Mus. Hist. Nat. Paris **25**, 57 (1919).

Rottboellia merguensis Hook. f., Fl. Brit. Ind. **7**, 158 (1896).

Distribution: Burma, Mergui.

The type of this species, *Helfer* s.n., is at Kew.

***Narenga* Bor** in Indian For. **66**, 267 (1940).

When the genus *Narenga* was established in 1940 the generic characters given were those of the single species upon which the new genus was based, namely, *Saccharum narenga*. The upper lemma of this species is unawned and truncate. Subsequently, as the result of a further study of the members of the Indian *Andropogoneae* in the Kew Herbarium, it became clear that the grass called *Erianthus chrysotrix* in the *Flora of British India*, conformed in all respects to the generic characters of *Narenga*, except in one, namely, that the upper lemma is sometimes awnless, sometimes awned. It therefore seems logical to widen the characters of *Narenga* as originally published to include species with awned spikelets. The pollen grains in *Narenga* differ in some degree from those in *Erianthus* and *Saccharum*, but the Gramineae is a stenopalynous family, and the grains, in the present state of our knowledge, cannot be relied upon to demonstrate or disprove relationships. The morphological characters of the spikelets are, however, remarkable enough to separate *Narenga* from other members of the *Saccharinae*.

Key to the species of *Narenga*

1. Sessile spikelets 4–5 mm; the whole panicle is golden or golden-brown in colour *N. fallax*
1. Sessile spikelets 2.5–3 mm long; the whole panicle is purplish or greyish-purple in colour *N. porphyrocoma*

1. **Narenga fallax** (Balansa) Bor in Kew Bull. 1948, 162 (1948).
Saccharum longifolium Munro ex Benth. in J. Linn. Soc. (Bot.) 19, 66 (1881) nomen nudum.
S. fallax Balansa in Morot, J. de Bot. 4, 80 (1890).
Erianthus chrysothrix Hack. in Öst. Bot. Z. 41, 6 (1891).
Eriochrysis longifolia Munro loc. cit. nomen nudum.
Erianthus longifolius (Munro) A. Camus in Lecomte, Fl. Gén. de l'Indo-Chine 7, 246 (1922).
E. fallax (Balansa) Ohwi in Bull. Tokyo Sci. Mus. no. 18, 2 (1947).
 Distribution: Khasia, Naga Hills, Burma, South-east Asia to Malaysia, between 600 and 1250 m altitude.

A magnificent grass reaching a height of 3 m in favourable places.
 Exsicc.—C. B. Clarke 44536A, Khasia; J. H. Lace 5946, Burma.

2. **Narenga porphyrocoma** (Hance) Bor in Indian Forest. 66, 267 (1940).
Saccharum narenga Wall. Cat. n. 8856 nomen.
Eriochrysis narenga Nees ex Steud. Syn. Pl. Glum. 1, 411 (1855).
E. porphyrocoma Hance ex Trim. in J. Bot. 14, 294 (1876).
Saccharum porphyrocoma (Hance) Hack. in DC., Monogr. Phan. 6, 120 (1889).

Distribution: Widely distributed in the tropical parts of South-east Asia.

Very common in the sal areas of India, where it is said to indicate that soil characters are favourable for the growth of *sal*. It possesses a very stout rhizome and must be reckoned as a good soil binder. The variety var. *khasianum* Hack. in DC., Monogr. Phan. 6, 120 (1889) does not appear to be worth keeping up.

Exsicc.—J. S. Gamble 15733, Tehri; T. Thoms. 1450, Punjab; A. A. Bullock 736, Manipur; C. E. Parkinson 298, Burma. $2n = 30$.

Ophiuros Gaertn. f., Suppl. Carpol. 3 (1805).

Key to the species of *Ophiuros*

1. Perennials; leaf-bases not cordate:—
 2. Leaves ensiform, hairy, with tubercle-based hairs on the margins, glabrescent with age; spikes usually solitary *O. megaphyllus*
 2. Leaves linear, quite glabrous; spikes corymbose *O. exaltatus*
1. Annuals:—
 3. Leaf-blades lanceolate from a broad subcordate base, more or less hirsute with tubercle-based hairs, particularly on the cartilaginous margin; peduncle glabrous *O. papillosus*
 3. Leaf-blades linear-acuminate, quite glabrous, very thin, smooth; peduncle pilose below the inflorescence *O. bombaiensis*

1. **Ophiuros bombaiensis** Bor in Kew Bull. 1951, 167 (1951).
 Distribution: Bombay State, Mysore.

An annual about which little is known.

Exsicc.—Type, *Meebold* 10764, Madras; *Sedgwick* 7018, Bombay.

2. **Ophiuros exaltatus** (Linn.) O. Ktze., Rev. Gen. Pl. 2, 780 (1891).
Aegilops exaltata Linn., Mant. 2, 575 (1771).

Ophiuros corymbosus Gaertn. f., Fruct. 3, 4 (1805), t. 181.

Distribution: Madras State, Western India, Northern India to Assam and on to China and Australia.

Exsicc.—*Duthie* 6533a, Bundelkhand; *Herb. Wight*. 1723, Madras.

3. **Ophiuros megaphyllus** Stapf ex Haines, Bot. Bihar and Orissa, 1058 (1924).

O. corymbosus of Fl. Brit. Ind. 7, 160 (1896) in part.

Distribution: Khasia, Naga Hills, Burma and South-east Asia generally.
 Exsicc.—*N. L. Bor* 6297, Naga Hills; *C. B. Clarke* 6015, Khasia.

According to Henrard in *Blumea* 4, 520 (1941) this species is widespread in Southeast Asia and the Philippines and had already been described by Elmer in *Leaflets Philipp. Bot.* 7, 2680 (1915) as *Rottboellia tongcalingii* Elmer. He therefore made a new combination, viz. *Ophiuros tongcalingii* (Elmer) Henr.

There are two sheets of Elmer's species in the herbarium at Kew, both of them distributed by Elmer himself. The leaves of both of these specimens are narrow, glabrous and linear; not at all like the coarse, ensiform, very broad leaves of Stapf's *O. megaphyllus* found in India.

It may be that these two species are connected by intermediates and are therefore synonymous, but since the two look so very different, it would be unwise to accept Henrard's new combination without a study of much more material than is now available.

4. **Ophiuros papillosus** Hochst. in Flora 27, 248 (1844).

O. aethiopicus Rupr. ex Steud., Syn. Pl. Glum. 1, 360 (1854).

Distribution: Nileland.

There is a single sheet of this species in Dr. Patel's Herbarium which is incorporated in the Blatter Herbarium, Bombay. This sheet gives no details. This species is said to be a troublesome weed and not to be eaten by cattle.

Phacelurus Griseb., Spicil. Fl. Rumel. et Bethyn.
 2, 423 (1844).

Pseudophacelurus A. Camus in Bull. Mus. Hist.
 Nat. Paris, 27, 370 (1921).

1. **Phacelurus speciosus** (Steud.) C. E. Hubbard in Kew Bull. 1928, 35 (1928).

Andropogon speciosus Steud., Syn. Pl. Glum. 1, 375 (1854).

Ischaemum speciosum Nees ex Steud., loc. cit. 375.

Andropogon corollatus Nees ex Steud., loc. cit. 369.

Ischaemum corollatum Nees ex Steud., loc. cit. 369.

Vossia speciosa Benth. in J. Linn. Soc. (Bot.) **19**, 70 (1881).

Rottboellia speciosa (Steud.) Hack. in DC., Monogr. Phan. **6**, 282 (1889).

Ischaemum robustum Hook. f., Fl. Brit. Ind. **7**, 139 (1896).

Pseudophacelurus speciosus (Steud.) A. Camus in Bull. Mus. Hist. Nat. Paris **27**, 370 (1921).

Distribution: North-western India, 1500–3000 m altitude.

This species develops an extremely extensive and tough root-system. It is presumably a grass which would be of use in badly eroded areas.

Exsicc.—*Royle* 888 K, Jhelum Valley; *C. B. Clarke* 22586, Dalhousie; *N. L. Bor* 14818, Lahul.

Pogonachne *Bor* in Kew Bull. **1949**, 176 (1949).

✓ 1. **Pogonachne racemosa** *Bor* in Kew Bull. **1949**, 176 (1949).

Distribution: Bombay State, endemic.

A stilt-rooted grass.

Exsicc.—*Blatter et McCann* 9925, 9926 Khandala; *Woodrow* s.n., Matheran.

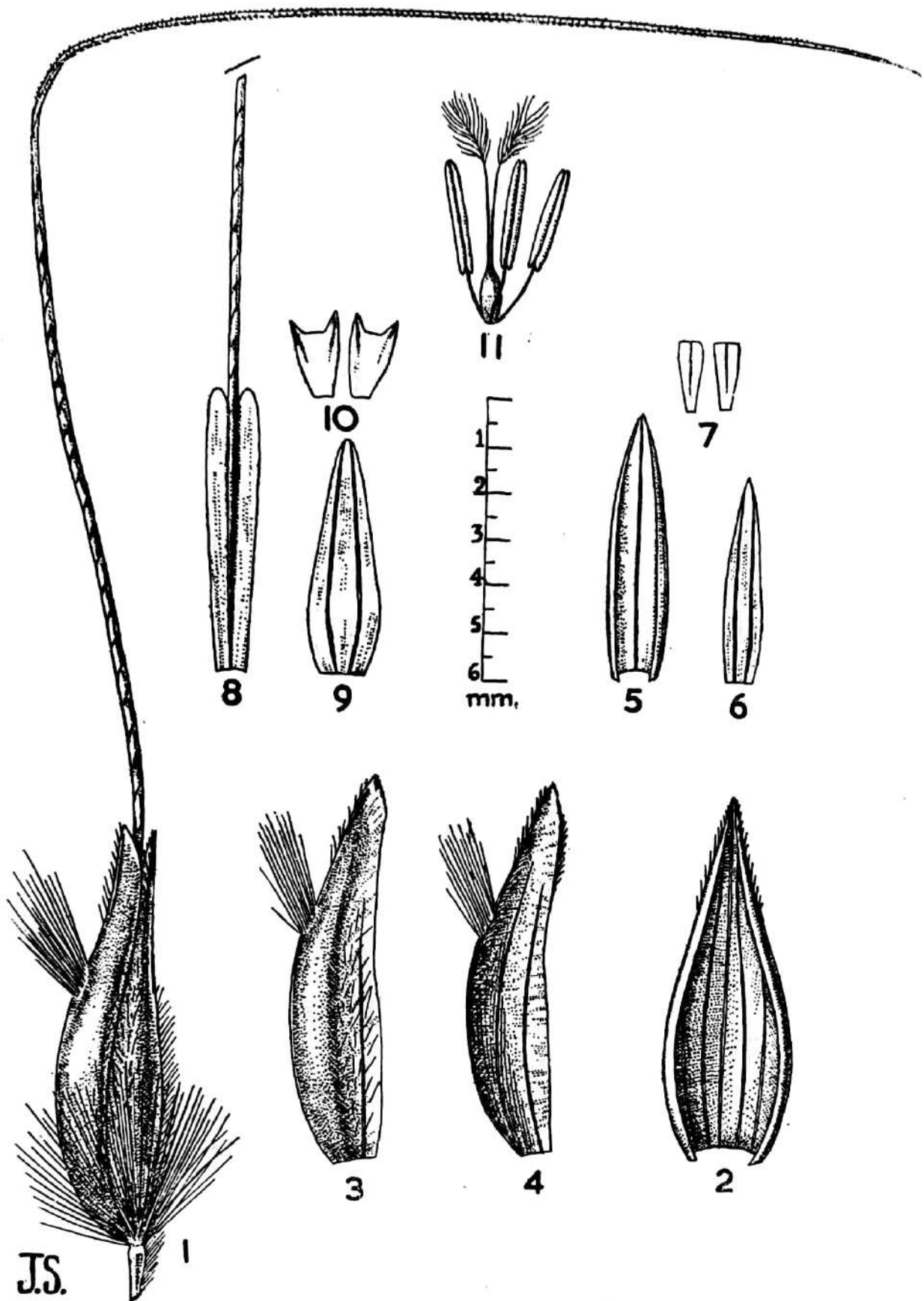
Pogonatherum *P. Beauv.*, Essai Agrost. **56**, 176 (1812)
t. 11, fig. 7.

Pogonopsis *J. S. Presl* ex *C. B. Presl*, Rel.
Haenk. **1**, 333 (1830).

Key to the species of *Pogonatherum*

1. Racemes up to 4 cm long; nodes bearded; spikelets up to 3 mm long:—
 2. Spikelets 2.5–3 mm long; callus-hairs up to 1.5 mm long; lower floret male; upper floret with 2 stamens *P. paniceum*
 2. Spikelets not more than 2 mm long; callus-hairs about 2 mm long; lower floret empty or obsolete; upper floret with 1 (rarely 2) stamens *P. crinitum*
1. Racemes more than 4 cm long; nodes glabrous; spikelets 4–5 mm long *P. rufo-barbatum*

- ✓ 1. **Pogonatherum crinitum** (*Thunb.*) *Kunth*, Enum. Pl. **1**, 478 (1833).
Andropogon crinitus *Thunb.*, Fl. Jap. **40** (1784), t. 7.
Homoplitis crinita (*Thunb.*) *Trin.*, Fund Agrost. **166** (1820).
Andropogon monandrus *Roxb.*, Fl. Ind. **1**, 264 (1820).
Pollinia monandra *Spreng.*, Syst. Veg. **1**, 288 (1825).
Ischaemum crinitum (*Thunb.*) *Trin.* in Mém. Acad. Sci. Pétersb. sér. **6**, **2**, 298 (1832).

Fig. 11. *Pogonachne racemosa* Bor

1, spikelet; 2, lower glume; 3, upper glume from the side—outer surface; 4, upper glume from the side—inner surface; 5, lemma of lower floret; 6, palea; 7, lodicules; 8, lemma of upper floret; 9, palea; 10, lodicules; 11, stamens and ovary.

Distribution: Common in India, ascending in the hills to 1500 m, extending to Malay and China.

This species is often gregarious on newly exposed soil such as slips in the hills and on stream-banks.

Exsicc.—*Kingdon-Ward* 7868, Abor Hills; *N. L. Bor* 4406, Naga Hills
Hook. f., s.n. Sikkim. $2n = 40$.

2. ***Pogonatherum paniceum* (Lamk.) Hack.** in *Allg. Bot. Z.* **12**, 178 (1906).

Saccharum paniceum Lamk., *Encycl. Meth. Bot.* **1**, 595 (1785): Tab. *Encycl.* **12**, 155 (1791), t. 40, f.3.

Pogonatherum saccharoideum P. Beauv., *Ess. Agrost.* 176, 177 (1812).

Perotis polystachya Willd., *Sp. Pl.* **1**, 324 (1798).

Pogonatherum polystachyum (Willd.) Roem. et Schult., *Syst. Veg.* **2**, 497 (1817).

Pollinia polystachya Spreng., *Syst. Veg.* **1**, 288 (1825).

Distribution: Common throughout India, Burma and Ceylon and rather in hotter and lower situations than those occupied by the aforementioned species. Often found in tufts on rocky banks.

Exsicc.—*Herb. Wight.* 3251, Madras; *Hook. f.*, s.n., Sikkim; *F. Ballard* 1055, Ceylon; *Parry* 814, Garo Hills. $2n = 20$.

3. ***Pogonatherum rufo-barbatum* Griff.**, *Not. Pl. Asiat.* **3**, 81 (1851).
Distribution: Khasi Hills, endemic.

The favourite habitat of this very tough grass is in clefts of rock constantly moistened by water, such as in stream-beds and the like.

Exsicc.—*N. L. Bor* 17958, Khasia; *C. B. Clarke* 45311, Khasia.

***Polytrias* Hack.** in Engler et Prantl, *Natürl.*

Pflanzenf. **2**, 2, 24 (1887).

1. ***Polytrias amaura* (Büse) O. Ktze.**, *Rev. Gen. Pl.* 788 (1891).

Andropogon amaurus Büse in Miq., *Pl. Junghn.* 360 (1854).

A. diversiflorus Steud., *Syn. Pl. Glum.* **1**, 370 (1854).

A. firmandus Steud., loc. cit. 370.

Pollinia praemorsa Nees ex Steud., loc. cit. 409 (1855).

Polytrias praemorsa (Nees) Hack. in Engl. et Prantl, *Natürl. Pflanzenf.* **2**, 2, 24 (1887).

P. diversiflora (Steud.) Nash in *Torreyia* **5**, 110 (1905).

Eulalia praemorsa (Nees) Stapf ex Ridley, *Fl. Mal. Pen.* **5**, 197 (1925).
Distribution: Burma, Malaya, South-east Asia and islands, China.

This grass has been collected once in the vicinity of Rangoon. It is commonly used as a lawn grass in the tropics.

Exsicc.—*U Thein Lwin* 2, Burma.

A reference is made to a *Pollinia praemorsa* in Hooker's *J. Bot.* 2, 98 (1850), but it is merely mentioned in a comparison and no description is given. The first description of this plant with the epithet *praemorsa* is that of Nees in Steudel.

Pseudanthistiria (Hack.) Hook. f., Fl. Brit. Ind. 7, 219 (1896).

Andropogon subgen. *Hypogynium*
sect. B. *Pseudanthistiria* Hack. in DC., Monogr. Phan. 6, 400 (1889).

Key to the species of *Pseudanthistiria*

1. Leaves covered more or less with tubercle-based hairs, not or hardly rounded at the base, linear; primary nerves on both sides of the mid-rib distinct; culms erect, robust:—
 2. Lower glume of sessile spikelet shortly hispid; margins of the spathes setose with stiff hairs from minute tubercles *P. heteroclita*
 2. Lower glume of sessile spikelet glabrous; margins of the spathes and often the dorsal surface in the lower half covered with setae from large, often dark-coloured, tubercles *P. hispida*
1. Leaves glabrous on both surfaces or with a few scattered white hairs from tubercle-bases, rounded at the base, rather thin, lanceolate; culms very weak and slender, creeping below and rooting at the nodes:—
 3. Awns 17–20 mm long; primary nerves in the leaf not distinguishable from the others *P. umbellata*
 3. Awns 25–35 mm long; primary nerves distinguishable *P. burmanica*

1. ***Pseudanthistiria burmanica*** Hook. f., Fl. Brit. Ind. 7, 220 (1896).
Andropogon monomerus Hochst. in Hohenack., Pl. Ind. Or. n. 183 (1847) nomen.

Distribution: Burma, endemic.

This species seems to have been collected on one occasion only. The type, S. Kurz 2755, Pegu, is at Kew.

- ✓ 2. ***Pseudanthistiria heteroclita*** (Roxb.) Hook. f., Fl. Brit. Ind. 7, 219 (1896).

Anthistiria heteroclita Roxb., Fl. Ind. 1, 253 (1820).

Andropogon heteroclitus (Roxb.) Nees, Fl. Afr. Austr. 115 (1841).

Distribution: Bombay State, Bengal, Madras State.

This species is often found growing gregariously on soil recently exposed. According to Blatter it is used chiefly for thatching.

Exsicc.—H. Santapau 5660, Purandhar Hill, Bombay; J. Cameron s.n., Kadu Hills, Madras.

- ✓ 3. ***Pseudanthistiria hispida*** Hook. f., Fl. Brit. Ind. 7, 219 (1896).
Distribution: Concan, Madhya Pradesh.

An annual which springs up gregariously in waste places.

Exsicc.—*Dalzell* s.n., Bombay; *J. F. Duthie* 8478, Madhya Pradesh.

- ✓ 4. ***Pseudanthistiria umbellata* (Hack.) Hook. f.**, Fl. Brit. Ind. 7, 220 (1896).

Andropogon umbellatus Hack. in DC., Monogr. Phan. 6, 401 (1889).

Distribution: Madras State, Ceylon.

Exsicc.—*F. Ballard* 1146, Ceylon; *C. A. Barber* 2336, Madras.

***Pseudodichanthium* Bor** in Indian For. 66, 271 (1940).

- ✓ 1. ***Pseudodichanthium serrafalcoides* (Cooke et Stapf) Bor** in Ind. For. 66, 272 (1940).

Andropogon cookei Stapf ex Woodrow in J. Bombay Nat. Hist. Soc. 13, 1901 438 (1893): nomen tantum.

addenda 1973 ed *A. (Dichanthium) serrafalcoides* Cooke et Stapf in Kew Bull. 1908, 450 (1908).

Dichanthium serrafalcoides (Cooke et Stapf) Blatt. et McCann in J. Bombay Nat. Hist. Soc. 32, 426 (1928).

Distribution: Bombay State, endemic.

According to Blatter this is a weak, straggling, gregarious species growing in shaded or partially shaded places.

Exsicc.—Type at Kew (*Woodrow* s.n., Sakarpattar); *Talbot* s.n., 1350 m, Marwar.

***Pseudopogonatherum* A. Camus** in Ann. Soc.

Linn. Lyon, n.s. 68, 202 (1921).

Puliculum Stapf ex Haines, Bot. Bihar and Orissa 1018 (1924).

Key to the species of *Pseudopogonatherum*

1. Awn up to 1.5 cm long

1. Awn 2.5–3.5 cm long

P. contortum

P. irritans

1. ***Pseudopogonatherum contortum* (Brongn.) A. Camus** in Lecomte, Fl. Gén. de l'Indo-Chine 7, 255 (1922).

Pogonatherum contortum Brongn. in Duperr., Voy. Coq. Bot. 90 (1831), ét. 17.

addenda 1973 ed *Pollinia articulata* Trin. in Bull. Sci. Acad. Petersb. 1: 71. (1836) 90/

• *Andropogon koretrostachys* Trin., loc. cit. 273.

• *Pollinia setifolia* Nees in Hook., Kew J. Bot. 2, 101 (1850).

Andropogon asthenostachys Steud., Syn. Pl. Glum. 1, 381 (1854).

Eulalia concinna Nees ex Steud., loc. cit. 412 (1855).

Erianthus articulatus (Trin.) F. Muell., Fragm. Phyt. Austr. 8, 118 (1872).

Pollinia collina Balansa in Morot, J. de Bot. 4, 81 (1890).

Eulalia contorta (Brongn.) O. Ktze., Rev. Gen. Pl. 2, 775 (1891).

Pseudopogonatherum collinum (Balansa) A. Camus in Lecomte, Fl. Gén. de l'Indo-Chine 7, 256 (1922).

P. setifolium (Nees) A. Camus, loc. cit. 256.

Puliculum articulatum (Trin.) Stapf ex Haines, Bot. Bihar and Orissa, 1018 (1924).

Eulalia koretrostachys (Trin.) Henr. in Blumea 4, 521 (1941).

Pseudopogonatherum koretrostachys (Trin.) Henr., loc. cit. 521.

Distribution: Widespread in Southeast Asia extending to Australia and China.

A grass often gregarious on open hillsides.

Exsicc.—Wallich 8814, Burma; J. S. Gamble 27446, Dehra; N. L. Bor s.n., Naga Hills.

This is a most variable species and certain subspecies and varieties have been established by Hackel based upon the rhachis and whether this is fragile or tough, and upon the spikelets whether all or only one is pedicelled.

These varieties are sometimes separated into three species according to the following key:

1. Upper glume aristate:—

2. Spikelets all pedicelled; rhachis tough *P. contortum*

2. Spikelets one sessile, one pedicelled; rhachis fragile *P. koretrostachys*

1. Upper glume without an arista; spikelets all pedicellate *P. collinum*

As the characters seem to merge into one another these three "species" are sunk under *P. contortum*, but the question needs further investigation.

2. ***Pseudopogonatherum irritans*** (R.Br.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 205 (1922).

Saccharum irritans R.Br., Prod. 203 (1810).

Erianthus irritans (R.Br.) F. Muell., Frag. Phyt. Austr. 8, 118 (1872).

Pollinia irritans (R.Br.) Benth., Fl. Austr. 7, 525 (1878).

Distribution: Burma, Malaya, Indo-China.

The collector states that this species is very common in the Prome District on deep coarse sand where *In* is dominant.

Exsicc.—U Thein Lwin 369, Burma.

Pseudosorghum A. Camus in Bull. Mus. Hist.

Nat. Paris 26, 662 (1920).

✓ 1. ***Pseudosorghum fasciculare*** (Roxb.) A. Camus in Bull. Mus. Hist. Nat. Paris 26, 662 (1920).

Andropogon fascicularis Roxb., Fl. Ind. 1, 269 (1820).

A. gangeticus Hack. in DC., Monogr. Phan. 6, 539 (1889).

- A. tonkinensis* Balansa in Morot, J. de Bot. 4, 112 (1890).
A. nitidulus Hook. f., Fl. Brit. Ind. 7, 199 (1896).
Sorghum fasciculare (Roxb.) Haines, Bot. Bihar and Orissa 1034 (1924).
S. gangeticum (Hack.) Stapf ex Haines, loc. cit. 1034.
 Distribution: Widespread in India, Burma and Southeast Asia. Not found so far in Bombay State or Ceylon.
 Exsicc.—Beddome s.n., Palghat; J. F. Duthie 10721, Dehra Dun.

Ratzeburgia Kunth, Rév. Gram. 2, 487 (1831).

Aikinia Wall., Pl. As. Rar. 3, 46 (1832) t. 273.

1. **Ratzeburgia pulcherrima** Kunth, Rév. Gram. 2, 487 (1831), t. 158.
Rottboellia pulcherrima Wall. ex Kunth, Enum. Pl. 1, 468 (1833) nomen.
Aikinia elegans Wall., Pl. As. Rar. 3 (1832) t. 273, but given its correct name in the text of vol. 3, p. 46.
Ophiurus auriculatus Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 246 (1832).

Distribution: Burma.

This species has apparently been collected on two occasions only, once by Wallich on the banks of the Irrawaddy near the petroleum wells, and once by Collett in North Burma. Both these sheets are at Kew. This grass sends out wiry stolons over the surface of the soil and presumably helps to bind it.

Exsicc.—Wallich 8868, Burma.

Rottboellia Linn. f., Dissert. Nov. Gram. Gen. 22 (1779); nomen genericum conservandum.

Key to the species of *Rottboellia*

1. Lower glume of the pedicelled spikelet lanceolate- or elliptic-oblong; racemes over 5 cm long *R. exaltata*
1. Lower glume of the pedicelled spikelet orbicular; racemes up to 5 cm long *R. goalparensis*
- ✓ 1. **Rottboellia exaltata** Linn. f., Nov. Gram. Gen. 40 (1779) t. 1, et in Suppl. Pl. 114 (1781).
Stegosia cochinchinensis Lour., Fl. Cochinch. 51 (1790).
Rottboellia setosa J. S. Presl ex C. B. Presl, Rel. Haenk 1, 329 (1830).
R. arundinacea Hochst. ex A. Rich., Tent. Fl. Abyss. 2, 444 (1851).
R. denudata Steud., Syn. Pl. Glum. 1, 362 (1854).
Ophiurus appendiculatus Steud., loc. cit. 359.
Manisuris exaltata (Linn. f.) O. Ktze., Rev. Gen. Pl. 2, 779 (1891).
Stegosia exaltata (Linn. f.) Nash in North Amer. Fl. 17, 84 (1909).
 Distribution: Common in Tropical Asia and Africa, Malaysia, Australia.



Fig. 12. *Ratzeburgia pulcherrima* Kunth

1, habit $\times 1$; 2, portion of the inflorescence, one of the lower spikelets removed; 3, lower glume; 4, upper glume; 5, upper lemma; 6, lower lemma, all $\times 8$; 7, palea of the upper lemma; 8, stamens; 9, gynaecium and lodicules, all $\times 12$

P

In Africa this grass is said to be excellent for hay, affording two cuttings, and also to be suitable for silos and green fodder. Cattle and horses are said to relish it at all times, but in India the stiff hairs on the sheaths and leaves do not make it popular with grazing animals, but buffaloes will eat it at any time, and other grazing animals when there is little else. Hook. f. has a variety, var. **robusta** Hook. f., under this species which he distinguishes by the stouter spikes and the more cordately-based leaves. It is hardly worth keeping up, especially as the characteristics are not constant, even in the same plant. $2n = 20$.

Exsicc.—N. L. Bor 6628, Assam; Po Khant 1316, Burma; W. Koelz 21774; F. Ballard 1484, Ceylon.

2. **Rottboellia goalparensis** Bor in Indian For. Rec. (Bot.) 1, 3, 100 (1938).

Distribution: Goalpara District, Haltugaon, Assam.

There is one collection only of this remarkable grass. The type number is at Kew (*A. Das* 10471).

Saccharum Linn., Gen. Pl. ed. 5, 28 (1754) et

Sp. Pl. ed. 1, 54 (1753).

Saccharifera Stokes, Bot. Mat. Med. 1, 131 (1812).

Key to the species and varieties of *Saccharum*

1. Spikelets not awned:—

2. Peduncle hairy below the panicle; rhachis very fragile; hairs very white-silvery *S. spontaneum*

2. Peduncle not hairy; rhachis less fragile:—

3. Lower glume of sessile spikelet glabrous; upper glume also glabrous *S. officinarum*

3. Lower glume of sessile spikelet with long hairs:—

4. Upper glume of sessile spikelet glabrous; panicles silvery or grey:—

5. Spikelets 4–6 mm long, longer than the joints of the rhachis; leaves glaucous *S. bengalense*

5. Spikelets 2.5–4 mm long, shorter than the joints of the rhachis; leaves green:—

6. Sessile spikelets 2.5–4 mm long; joints 3.5–4 mm long; pedicels 2–2.5 mm long; leaves villous at the base only; strip of green blade broader than the midrib; panicle not very loose or silky *S. arundinaceum*

6. Sessile spikelets 3–4 mm long; joints 6–7 mm long; pedicels 2.5–3.5 mm long; leaves villous in lowest 10 cm; strip of green blade narrower than midrib; panicle looser and more silky *S. procerum*

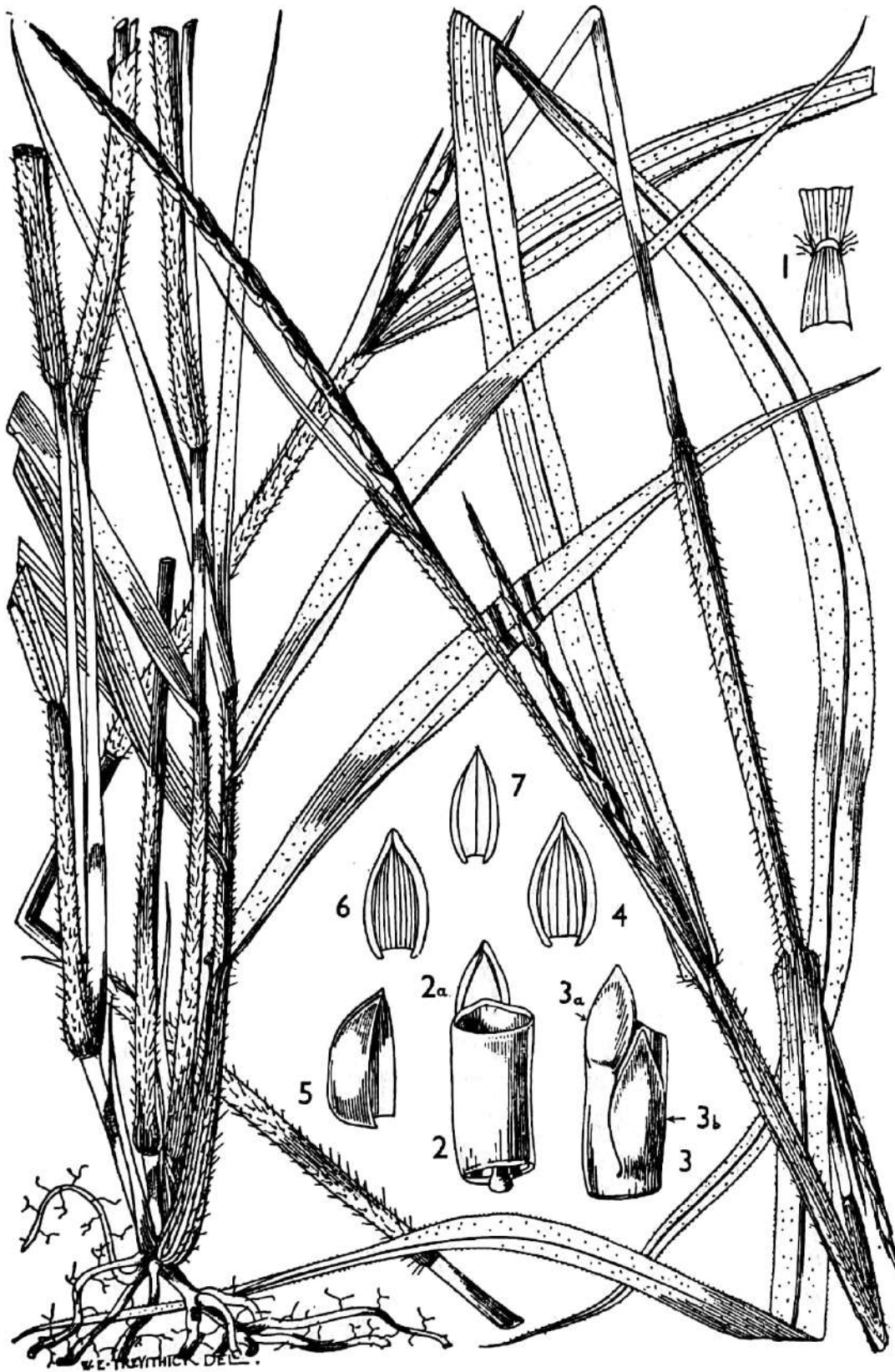


Fig. 13. *Rottboellia exaltata* Linn. f.

Plant $\times \frac{1}{4}$. 1, ligule; 2 and 3, joints—2a and 3a, pedicelled spikelets, 3b, sessile spikelet; 4, lower glume and 5, upper glume, both of sessile spikelet; 6, lower glume and 7, upper glume, both of pedicelled spikelet; all $\times 2$.

4. Upper glume of sessile spikelet villous; panicles creamy-white; often interrupted *S. griffithii*
1. Spikelets awned:—
7. Panicle decompound, ultimate branches very short, of 3–4 joints:—
8. Panicle up to 40 cm long by 15 cm broad, very thick with crowded spikelets, purplish; spikelets about 3–4 mm long or somewhat longer; joints about as long; awn well exerted; glumes of sessile spikelet glabrous, of the pedicelled spikelet with few or sparse hairs; lower glume 2-keeled, spinulose-scabrid on the keels *S. ravennae*
8. Panicle up to 25 cm long by 5 cm wide, interrupted, creamy-white; spikelets 6 mm or more long; lower and upper glumes hairy; awn slightly exerted *S. griffithii*
7. Panicle of long simple branches sparingly divided (branches short in *S. rufipilum*):—
9. Awns 3.5–4 cm long; spikelets 8–9 mm long; upper lemma 7 mm long, bifid with long, very narrow lobes *S. macratherum*
9. Awns not more than 2 cm long:—
10. Upper lemma entire at the apex, very narrow; leaf-blades almost all midrib:—5-5.5
11. Spikelets 3-3.5 mm long, twice as long as the joints, surrounded by mauve-coloured long hairs *S. rufipilum*
11. Spikelets 4–5 mm long, as long as the joints, surrounded by silvery-golden or golden hairs *S. sikkimense*
10. Upper lemma 2-fid at the apex, awned in the sinus; blades broad to very broad or filiform:—
12. Blades broad; stems glabrous or pubescent below the nodding inflorescence:—
13. Glumes sparsely or densely hairy:—
14. Stem glabrous below the panicle; spikelets 4–5.5 mm long, equal to or usually longer than the raceme-joints; glumes sparsely hairy in the lower third; palea of the upper floret 2 mm long, narrow, shortly ciliate *S. longisetosum* var. *longisetosum*
14. Stems pubescent below the panicle; spikelets 5.5–6.5 mm long, usually longer than the joints of the raceme; lower and upper glumes densely hairy in the lower half; palea of the upper floret short *S. longisetosum* var. *hookeri*
13. Glumes absolutely glabrous; longest callus-hairs twice the length of the 4–4.5 mm long spikelets; palea of the upper floret a hyaline scale 0.5 mm long, long-ciliate *S. wardii*
12. Blades narrow, subulate or filiform, almost all midrib; racemes erect; stems pubescent below the panicle:—
15. Spikelets 6 mm long; lower glumes, joints and pedicels covered with golden hairs *S. williamsii*

15. Spikelets 4–6 mm long; lower glume glabrous; joints and pedicels covered with purplish-reddish hairs *S. filifolium*

1. ***Saccharum arundinaceum* Retz.**, Obs. Bot. 4, 14 (1786).
Erianthus arundinaceus (Retz.) Jeswiet in Arch. Suikerind. Ned.-Ind. 399 (1925).

Distribution: India, Burma and Ceylon.

The straight, strong culms are used for making walls of huts.

Exsicc.—*Wallich* 8852, Himalaya; *Hook. f. et T. Thoms.* 308, Chittagong; *Burma Herb.* 8029. $2n = 40, 60$.

- ✓ 2. ***Saccharum bengalense* Retz.**, Obs. Bot. 5, 16 (1789).
S. munja Roxb., Fl. Ind. 1, 250 (1820).
S. sara Roxb., loc. cit. 249.
S. ciliare Anderss. in Oefvers. Vet. Akad. Förhand. Stockh. 155 (1855).
S. arundinaceum Hook. f., Fl. Brit. Ind. 7, 119 (1896) in part, non Retz.
Erianthus munja (Roxb.) Jeswiet in Arch. Suikerind. Ned.-Ind. 399 (1925).
E. sara (Roxb.) Rümke in Arch. Suikerind. Ned.-Ind. 223 (1934).
E. ciliaris (Anderss.) Jeswiet in loc. cit. 399.

Distribution: North and north-western India.

This is a very large tufted grass which is of little account as a fodder plant since cattle and buffaloes will only eat the tender young leaves. A valuable fibre can be extracted from the upper leaf-sheaths of the flowering culm.

Exsicc.—*Herb. Royle*; *H. H. Haines* 2861, Dehra Dun. $2n = 60$.

3. ***Saccharum filifolium* Steud.**, Syn. Pl. Glum. 1, 409 (1855).
Erianthus filifolius Nees ex Steud., loc. cit. 409.

Distribution: North-western Himalaya, 1500–2500 m.

The very wiry leaves of this stout perennial render its identification easy.

Exsicc.—*J. S. Gamble* 25736, Tehri; *Trotter* 669, Hazara; *T. Thoms.* s.n., Loharghat; *R. R. Stewart* 9100, Murree.

- ✓ 4. ***Saccharum griffithii* Munro ex Aitch.** in J. Linn. Soc. (Bot.) 19, 191 (1882) nomen et ex Boiss., Fl. Orient. 5, 453 (1884) descr.
Erianthus griffithii (Munro) Hook. f., Fl. Brit. Ind. 7, 122 (1896).
Saccharum ciliare var. *griffithii* Hack. in DC., Monogr. Phan. 6, 119 (1889).

Distribution: Afghanistan, Baluchistan, Punjab, Chitral.

This species is stated to be of no use as a fodder grass. The dried inflorescences are sometimes exported to European countries to be used for decorative purposes.

Exsicc.—*J. R. Drummond* 15105, Punjab; *Gatacre* 17608, Chitral; *R. R. Stewart* 515B, Peshawar.

5. ***Saccharum longisetosum* (Anderss.) Narayanaswami ex Bor**, Fl. Assam 5, 461 (1940).

E. pallens Hack. in DC., loc. cit. 145.

Distribution: Hills of North and north-east India.

Common in the hills on exposed rocky slopes.

Exsicc.—J. F. Duthie 14513, Tehri; R. R. Stewart 12430, Kashmir; Treutler 835, Sikkim.

12. *Saccharum sikkimense* (Hook. f.) Narayanaswami ex Bor, Fl. Assam 5, 462 (1940).

Erianthus sikkimensis Hook. f., Fl. Brit. Ind. 7, 123 (1896).

Distribution: Sikkim at an elevation of about 2000 m.

This is a very handsome grass and would merit cultivation for its decorative value alone.

Exsicc.—Hook. f., s.n. Lachen (type); R. E. Cooper s.n., Bhutan.

✓ 13. *Saccharum spontaneum* Linn., Mant. Alt. 183 (1771).

Imperata spontanea (Linn.) P. Beauv., Ess. Agrost. 8 (1812).

Saccharum semidecumbens Roxb., Fl. Ind. 1, 241 (1820).

S. canaliculatum Roxb., loc. cit. 251.

S. insulare Brongn. in Duperr., Voy. Coq. Bot. 99 (1831).

S. propinquum Steud., Syn. Pl. Glum. 1, 406 (1855).

Distribution: Widely distributed in the warmer regions of the Old World.

This species flowers and fruits at the end of the rains and is therefore capable of colonizing areas such as soil and sand left bare by retreating floods. The root-system is extremely extensive and the grass acts as an effective soil-binder. If it should be burned in the dry season it will be ousted by *Narenga*, *Imperata* and species of *Saccharum* which flower and fruit at this time. This species is found in a very large number of races, some of which, indeed, may merit specific rank. The chromosome numbers (2n) vary from 48 to 128.

Exsicc.—R. R. Stewart 9520, Punjab; A. A. Bullock 687, Manipur; N. L. Bor 6474, Naga Hills.

14. *Saccharum wardii* (Bor) Bor, comb. nov.

Erianthus wardii Bor in Kew Bull. 1954, 498 (1955).

Distribution: Burma, North Triangle, Kainjaw, c. 1000 m.

A reed-like grass over 4 m tall, of which the type is at Kew (K.W. 21666).

15. *Saccharum williamsii* (Bor) Bor, comb. nov.

Erianthus williamsii Bor in Kew Bull. 1957, 413 (1957).

Distribution: Nepal.

Exsicc.—Stainton, Sykes & Williams 3676, 4499, Nepal.

Schizachyrium Nees, Agrost. Bras. 331 (1829).

Key to the species of *Schizachyrium*

1. Annuals:—

2. Awns not more than 15 mm long; plants turning red at maturity; racemes usually seated in the subtending sheath, rather stiff:—

3. Leaves linear, rounded at the apex to an obtuse tip; joints of the raceme 2–3 mm long; very slender plants *S. brevifolium*
3. Leaves tapering to an acuminate tip; joints of the raceme 4–6 mm long; robust plants *S. exile*
2. Awns 30 mm long; plant remaining green at maturity; racemes long-exserted from the subtending sheath, rather flexuous *S. paranjpyeanum*
1. Perennials:—
 4. Lower glume of the sessile spikelet deeply concave; lemma of the upper floret deeply cleft *S. impressum*
 4. Lower glume of the sessile spikelet not deeply concave, flat, convex or very shallowly concave; lemma of the upper floret deeply or shortly cleft:—
 5. Joints of the racemes about as long as the spikelets; the latter sunk in the concave faces of the joints; lower glume of the sessile spikelet dorsally rounded; upper lemma deeply cleft *S. sanguineum*
 5. Joints of the raceme slender, not hollowed, about half as long as the spikelets; lower glume of the sessile spikelets flattened on the dorsal surface; upper lemma not deeply cleft *S. delavayi*

✓ 1. **Schizachyrium brevifolium** (Sw.) Nees ex Büse in Miquel, Plant. Junghn. 359 (1854).

Andropogon brevifolius Sw., Prodr. Veg. Ind. Occ. 26 (1788).

Pollinia brevifolia (Sw.) Spreng., Syst. Veg. 1, 288 (1825).

Andropogon obtusifolius Poir. in Lamk., Encycl. Meth. Bot. Suppl. 1, 583 (1810).

A. parviflorus Roxb., Fl. Ind. 1, 277 (1820).

A. floridus Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 265 (1832).

A. debilis Kunth, Enum. Pl. 1, 488 (1833).

Pollinia vaginata Spreng., Pugill. 2, 11 (1815).

Distribution: Widespread in India; tropics of the Old World.

This delicate annual is found in waste places, abandoned fields and slips and banks in the hills, ascending to 1700 m. As the species matures the leaves and sheaths turn a rosy red.

Exsicc.—N. L. Bor, 2371, Goalpara; C. B. Clarke 44704, Khasia; Bourne 64, Madras.

2. **Schizachyrium delavayi** (Hack.) Bor in Indian For. Rec. (Bot.) 1, 3⁹⁵ (1938).

Andropogon delavayi Hack. in DC., Monogr. Phan. 6, 404 (1889).

Eremopogon delavayi (Hack.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 68, 208 (1922).

Andropogon bootanensis Hook. f., Fl. Brit. Ind. 7, 166 (1896).

Schizachyrium bootanense (Hook. f.) A. Camus in Ann. Soc. Linn. Lyon, n.s. 70, 90 (1923).

Distribution: Naga Hills, Sikkim, Bhutan, Tibet.

Often in patches on open hillsides.

Schizachyrium scoparium (Michx.) Nash in Small, Fl. South-east U.S. 59, 1326 (1903).

Andropogon scoparius Michx., Fl. Bor. Amer. 1, 57 (1803).

Distribution: Common in the U.S.A. from Quebec and Maine to Alberta and south to Florida and Arizona; introduced into Pakistan (?).

Exsicc.—Jafri 1113, Khairpur Div., Koldigi—cultivated land.

Sclerostachya (Anderss.) A. Camus in Lecomte,
Fl. Gén. de l'Indo-Chine 7, 243 (1922).

Sclerostachyum Stapf in Ridley, Fl. Malay Penin. 5, 186, 194 (1925).

Andropogon subgenus *Sclerostachya* Anderss. ex Hack. in DC., Monogr. Phan. 6, 121 (1889).

Key to the species of *Sclerostachya*

1. Very robust grass; culms up to 1.5 cm thick; spikelets 3 mm long, 1.25 mm wide, obovate-elliptic in shape *S. fusca*
1. Slender grass; culms hardly more than 0.5 cm thick; spikelets 3.5 mm long, 1.25 mm wide, widest at the middle *S. milroyi*

1. ***Sclerostachya fusca*** (Roxb.) A. Camus in Lecomte, Fl. Gén. de l'Indo-Chine 7, 243 (1922).

Saccharum fuscum Roxb., Fl. Ind. 1, 241 (1920).

Eriochrysis fusca (Roxb.) Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 2, 315 (1832).

E. attenuata Nees ex Steud., Syn. Pl. Glum. 1, 411 (1855).

Miscanthus fuscus (Roxb.) Benth. in J. Linn. Soc. (Bot.) 19, 65 (1881).

Distribution: India, Burma, South-east Asia to Indo-China.

Exsicc.—Parkinson 14658, Burma; Griffith, Burma; Parry 877, Garo Hills; T. Thoms. Gangetic Plain. $2n = 48, 96$.

2. ***Sclerostachya milroyi*** Bor, Indian For. Rec. (Bot.) 1, 3, 85 (1938).

Distribution: Upper Assam.

It is possible that this species is only an extreme depauperate state of the former.

Exsicc.—N. L. Bor s.n., Sibsagar, Assam.

Sehima Forssk., Fl. Aegypt.-Arab. 178 (1775).

Hologamium Nees in Edinb. New Phil. J. 18, 185 (1835).

Key to the species of *Sehima*

1. Lower glume of sessile spikelets rounded on the back, with a deep longitudinal slit-like groove *S. sulcatum*
1. Lower glume without a slit but grooved deeply or shallowly:—

2. Lower glume of sessile spikelet almost flat or dorsally shallowly depressed *S. notatum*
2. Lower glume more or less deeply grooved:—
 3. Sessile spikelets 8–9 mm long; awn very minutely ciliate along spiral; lower glume of pedicelled spikelet lanceolate-acuminate, slightly 2-toothed; perennial *S. nervosum*
 3. Sessile spikelets 9–14 mm long; awn distinctly ciliate along spiral; lower glume of pedicelled spikelet narrowly lanceolate, long-acuminate, with 2 long setaceous teeth; annual *S. ischaemoides*

- ✓ 1. ***Sehima ischaemoides*** Forssk., Fl. Aegypt.-Arab. 178 (1775).
S. inscalptum Hochst. in Flora 27, 247 (1844).
S. kotschyi Hochst. in loc. cit. 247.
Andropogon sehima Steud., Syn. Pl. Glum. 1, 369 (1854).
A. lineatus Steud., loc. cit. 369.
A. rhyncophorus Stapf in Mém. Bot. Soc. Fr. 8, 101 (1908).
A. inscalptus (Hochst.) Anderss. ex Schweinf., Beitr. Flor. Aethiop. 306 (1867).
Ischaemum inscalptum (Hochst.) A. Rich., Tent. Fl. Abyss. 2, 472 (1851).
 Distribution: Tropical Africa, Nileland, Tropical Arabia, Bombay and South India.

A good fodder in subdesert areas where it springs up in sand in the rainy season.

Exsicc.—Talbot 4456, Bombay; Woodrow s.n., Madras.

- ✓ 2. ***Sehima nervosum*** (Rottl.) Stapf in Prain, Fl. Trop. Afr. 9, 36 (1917).
Andropogon nervosus Rottl. apud Willd. in Verh. Ges. Naturf. Freund. Berlin, Neue Schr. 4, 218 (1806). 3
A. striatus Klein apud Willd., Sp. Pl. 4, 903 (1806).
Hologamium nervosum (Rottl.) Nees in Edinb. New Phil. J. 18, 185 (1835).
Ischaemum macrostachyum (Hochst.) A. Rich., Tent. Fl. Abyss. 2, 472 (1851).
Andropogon tacazensis Steud., Syn. Pl. Glum. 1, 369 (1854).
A. macrostachys Anderss. in Schweinf., Beitr. Fl. Aethiop. 310 (1867).
Ischaemum nervosum Thw., Enum. Pl. Zeyl. 365 (1864).
Sehima macrostachyum Hochst. ex Hack. in DC., Monogr. Phan. 6, 245 (1889).
Ischaemum laxum R.Br. Prod. 205 (1810).

Distribution: Widespread in South-east Asia, East Africa and Australia.
 This is often subgregarious and is considered to be an excellent fodder grass.

Exsicc.—N. L. Bor 16956, Manipur; J. S. Gamble 18669, Madras.
 2n = 34, 40.

- ✓ 3. ***Sehima notatum*** (Hack.) A. Camus in Bull. Mus. Hist. Nat. Paris 27, 373 (1921).

Ischaemum notatum Hack. in DC., Monogr. Phan. 6, 246 (1889).

Distribution: Western Himalaya between 1200 and 2000 m.

Exsicc.—J. F. Duthie 5057, Kumaon; Strachey & Winterbottom 37, Almora.

- ✓ 4. *Sehima sulcatum* (Hack.) A. Camus in Bull. Mus. Hist. Nat. Paris 27, 373 (1921).

Ischaemum sulcatum Hack. in DC., Monogr. Phan. 6, 248 (1889).

Distribution: Madhya Pradesh, South India.

This is considered to be an excellent fodder grass.

Exsicc.—J. F. Duthie 8517. Madhya Pradesh; Bourne 51, Madras.

Sorghastrum Nash in Britton, Man. Fl. N.U. States 71 (1901).

1. *Sorghastrum nutans* (Linn.) Nash in Small, Fl. Southeast U.S. 66 (1903).

Andropogon nutans Linn., Sp. Pl. ed. 1, 1045 (1753).

A. avenaceus Michx., Fl. Bor. Amer. 1, 58 (1803).

A. ciliatus Ell., Bot. S.C. & G. 1, 144 (1816).

Sorghum nutans (Linn.) A. Gray, Man. 617 (1848).

S. avenaceum Chapm., Fl. South U.S. 583 (1860).

Chrysopogon nutans (Linn.) Benth., in J. Linn. Soc. (Bot.) 19, 73 (1881).

C. avenaceus (Michx.) Benth. in loc. cit. 73.

Sorghum nutans subsp. *avenaceum* (Michx.) Hack. in Mart., Fl. Bras. 2, 3, 274 (1883).

S. nutans subsp. *linnaeanum* Hack. in loc. cit. 276.

Andropogon albescens Fourn., Mex. Pl. 2, 56 (1886).

A. confertus Trin. ex Fourn., loc. cit. 55.

A. nutans var. *avenaceus* (Michx.) Hack. in DC., Monogr. Phan. 6, 530 (1889).

Chrysopogon nutans var. *avenaceus* Cov. et Brann., Rept. Geol. Surv. Ark. 4, 234 (1891).

Poranthera nutans Raf. ex Jacks., Ind. Kew. 2, 606 (1894).

P. ciliata Raf. ex Jacks., loc. cit. 606.

Chrysopogon nutans var. *linnaeanus* Mohr in Bull. Torr. Bot. Club 24, 21 (1897).

Sorghastrum avenaceum (Michx.) Nash in Britton, Man. 71 (1901).

Andropogon linnaeanus (Hack.) Scribn. et Kear. in Scribn. et Ball. in Bull. U.S. Dept. Agri., Div. Agrost. 24, 40 (1901).

Sorghastrum linnaeanum (Hack.) Nash in Small, Fl. Southeast. U.S. 66 (1903).

Holcus nutans (Linn.) O. Ktze. ex Stuck. in Ann. Mus. Nac. Buenos Aires 11, 48 (1904).

H. nutans var. *avenaceus* Hack. ex Stuck., loc. cit. 48.

Chalcoelytrum nutans (Linn.) Lunell in Amer. Midl. Nat. 4, 212 (1915).

Distribution: Central and Eastern U.S.A. where it is a constituent of the vegetative covering of prairies, open woods and dry slopes. It extends to Mexico and has also been introduced into India.

In its native home it is one of the important grasses in prairie hay.
 $2n = 20, 40$.

***Sorghum* Moench, Meth. Pl. 207 (1794).**

Sorgum Adans., Fam. Pl. 2, 38, 606 (1763) nom. illegit.

As some doubt seems to exist about the correct way in which this generic name should be spelt, a brief examination of this question appears necessary. The difficulty really exists because of the two names *Sorgum* Adanson (1763) and *Sorghum* Moench (1794).

To get at the root of the matter one must go back to the genus *Holcus* of Linnaeus (1754). In this genus were seven species, namely, *H. sorghum*, *H. saccharatus*, *H. halepensis*, *H. lanatus*, *H. odoratus*, *H. laxus* and *H. striatus*. Of these seven, the first three are species of the genus *Sorghum* as we know it today. *H. lanatus* is still a *Holcus* and the species mentioned is a well-known European grass, which has been introduced into India. *H. odoratus* is a *Hierochloa*, *H. laxus* a species of *Uniola* and *H. striatus* a species of *Sacciolepis*. Adanson, when describing his genus *Sorgum*, did not specifically segregate any of the Linnean species to typify his genus. What he actually did was to use *Sorgum* Adans. for *Holcus* Linn., a procedure which rules out the name *Sorgum* on the grounds that it is a superfluous name. Moench on the other hand took *Holcus saccharatus* Linn. and another Linnean species (*H. bicolor* Linn.) as the basis of his genus *Sorghum*. He retained *H. lanatus* as a species of *Holcus*. In other words, Moench had a perfect conception of what he meant by the genus *Sorghum* and the two species upon which he based his genus are still recognized as typical species of *Sorghum*. Hence Moench's name and spelling must be retained for this genus.

The following account of the Indian varieties of the grain sorghums is based entirely on the book on this subject by J. D. Snowden. The keys in that book have been adapted to the varieties and races found in India, with the permission of Mr. Snowden and the Bentham-Moxon Trustees. It must not be understood that the author has done any work on *Sorghum*, since Mr. Snowden's book is at present the last word on the cultivated species.

Key to the sections and series of the genus ***Sorghum***

1. Sheath-nodes glabrous or finely pubescent, not bearded:—
2. Annuals or tufted perennials without rhizomes Sect. ***Sorghum***
3. Racemes fragile; mature spikelets deciduous with the adjoining joint and the pedicel of the pedicelled spikelet Subsect. ***Arundinacea***
- Series ***Spontanea***

- Sect. **Sorghum** Stapf emend. Snowden in Kew Bull. 1935, 222 (1935)
 Subsect. *Halepensis* Snowden loc. cit. and
 Subsect. *Arundinacea* Snowden loc. cit.
 (Series *Spontanea*)

1. Perennials with well-developed more or less extensively creeping rhizomes:—
2. Pedicelled spikelets deciduous when mature, 3·8–6·2 mm long; rhizomes long:—
3. Sessile spikelets more or less obtuse, elliptic to subelliptic or elliptic-lanceolate, 4–5·5 mm long; glumes coriaceous; lower glume with the keels ending in distinct minute teeth, forming with the subhyaline apex a more or less distinct 3-toothed tip:—
4. Leaf-blades narrow, 0·5–2 cm wide (rarely more); culms slender, 0·5–1·5 m high, up to 5 mm wide; panicles small, often somewhat contracted after flowering, up to 25 cm long and 5 cm wide, with the lower branches about 5–8 cm long *S. halepense*
4. Leaf-blades somewhat broad, mostly 2–4 cm wide when mature; culms slender to robust, up to 1 cm wide, usually 2–3 m high; panicles large, loose and spreading, generally 25–55 cm long, 10–25 cm wide, with the lower branches 10–25 cm long
S. miliaceum
5. Sessile spikelets 4·8–5·5 mm long, 1·8–2·3 mm wide
S. miliaceum var. *miliaceum*
5. Sessile spikelets 4–4·5 mm long, 1·5–1·8 mm wide
S. miliaceum var. *parvispiculum*
3. Sessile spikelets acute to acuminate; glumes subcoriaceous with somewhat papery tips; lower glume with the keels ending without or with only obscure teeth:—
6. Sessile spikelets 5–6·2 mm long, acuminate to acute, often awned; panicle small, 15–30 cm long, lower branches 5–15 cm long; culms usually 0·5–2 m high, 0·3–1 cm wide; leaf-blades narrow, 0·5–2 cm wide
S. controversum
6. Sessile spikelets 3·8–5 mm long, abruptly acute with a short fine point, usually awnless; panicle large, 20–60 cm long, lower branches 15–20 cm long; culms 2–3 m high, 1–3 cm wide; leaf-blades broad, often 3–5 cm wide
S. propinquum

6a. Sessile spikelets 3.8–4.5 mm long, 1.2–1.8 mm wide

S. propinquum var. *propinquum*

6a. Sessile spikelets 4.5–5 mm long, 1.8–2 mm wide

S. propinquum var. *siamense*

2. Pedicelled spikelets not deciduous at maturity; if they fall at all they fall with a portion of the pedicel attached to the base of the spikelet; rhizomes short *S. alnum*

1. Perennials without rhizomes, or annuals:—

7. Leaf-blades mostly 45–60 cm long; sessile spikelets elliptic-lanceolate, acuminate, 6–7 mm long *S. verticilliflorum*

7. Leaf-blades 4–10 cm long, acuminate; sessile spikelets oblong-lanceolate, 5.5–6.5 mm long *S. pugionifolium*

1. ***Sorghum* × *alnum* Parodi** in Rev. Argent. Agron. 10, 361 (1943).

Distribution: Argentina, introduced into India. I.A.R.I. reports that it gives six cuttings under irrigation, that it is slightly drought-resistant, but susceptible to frost. Seed-setting is satisfactory.

This species is cultivated for fodder in the Argentine and is apparently a spontaneous hybrid. According to Parodi, who described it, its facies is intermediate between that of *Sorghum halepense* and that of *S. sudanense* and agrees with the former in being a perennial and possessing rhizomes. Its chromosome number is $2n = 40$. He assumed it to be a hybrid between *S. halepense* ($2n = 40$) and a member of the series *Arundinacea* ($2n = 20$). Saez and Nuñez [*Notas Mus. La Plata* 8, 333 (1943)] who investigated the species cytologically agreed with Parodi. They came to the conclusion that the hybrid arose by the fusion of an ordinary gamete of *Sorghum halepense* and a diploid gamete of a species of the series *Arundinacea*. Another possibility is that the hybrid is the result of a cross between a race of *S. halepense* with $2n = 20$ (such a race has been reported by Dr. E. K. Janaki Ammal from India) and one of the series *Arundinacea* ($2n = 20$) followed by chromosome doubling, in other words an allo-tetraploid.

✓ 2. ***Sorghum controversum* (Steud.) Snowden** in J. Linn. Soc. (Bot.) 55, 210 (1955).

Andropogon laxus Roxb., Fl. Ind. 1, 275 (1820) non Willd. (1806).

A. controversus Steud., Syn. Pl. Glum. 1, 391 (1854).

Distribution: From Bengal to Bihar and on to Madras. $2n = 40$.

Exsicc.—Wallich 8778H, Bengal; Mokim 1417, Orissa.

✓ 3. ***Sorghum halepense* (Linn.) Pers.**, Syn. Pl. 1, 101 (1805).

Holcus halepensis Linn., Sp. Pl. ed. 1, 1047 (1753).

Andropogon arundinaceus Scop., Fl. Carn. ed. 2, 2, 274 (1772).

Milium halepense (Linn.) Cav., Descr. Pl. 306 (1802).

Blumenbackia halepensis (Linn.) Koel., Descr. Gram. 29 (1802).

Andropogon sorghum (Linn.) Brot. subsp. *halepensis* Hack. in DC., Monogr. Phan. 6, 501 (1889).

Andropogon verticilliflorus Steud., Syn. Pl. Glum. 1, 393 (1854).

Distribution: Appears to be confined to Madras State in India, elsewhere widely spread in the tropics of the world. $2n = 20$.

Exsicc.—Wallich 8778D/3, Madras.

Sect. *Sorghum*

Subsect. *Arundinacea*

Series *Sativa*

Key to the cultivated species of *Sorghum* (Sect. *Sorghum*) (after Snowden).

1. Sessile spikelets more or less lanceolate, elliptic, or oblong usually twice as long as broad when in flower, never broadest above the middle even when in fruit, and never transversely wrinkled or depressed across the middle; pedicels of the pedicelled spikelets 2–4 mm long:—
2. Glumes of the sessile spikelets coriaceous, with the nerves usually more or less obscure except towards the tips; pedicels of the pedicelled spikelets long and slender, usually 2–4 mm long; panicle loose or rarely contracted but not densely compact:—
3. Sessile spikelets elliptic-lanceolate to oblong-lanceolate or elliptic, acute or acuminate, 6–7.5 mm long, glabrous or rarely permanently hairy; upper lemma often awned; grains much compressed and flattened, 5–6.5 mm long, 4–5.5 mm wide, shorter than or as long as the widely gaping glumes *S. conspicuum*
3. Sessile spikelets lanceolate to ovate-lanceolate, acute or shortly acuminate, 4–6 mm long, hairy to villous when young, more glabrous when mature or permanently hairy; upper lemma rarely awned; grains biconvex or slightly compressed, shorter, or as long as, or rarely slightly longer than the glumes, freely exposed, or less often clasped by one or both glumes *S. roxburghii*
2. Glumes of the sessile spikelets, or at least the lower glume, thinly crustaceous to papery and more or less striately nerved to the middle or below the middle, rarely with the nerves obscure except in the upper third; mature grains usually shorter than or as long as the glumes, rarely longer, entirely enclosed or more or less exposed; pedicelled spikelets persistent or rarely almost suppressed:—
4. Glumes, or at least the lower, thin and papery; sessile spikelets elliptic, elliptic-oblong or oblong:—
5. Both glumes papery throughout or sometimes subcoriaceous in the lower third; sessile spikelets 5–11 mm long; grains shorter than the glumes, remaining enclosed or at length more or less exposed at the top *S. membranaceum*
5. Lower glume thin and papery; upper glume more coriaceous; sessile spikelets 4–5 mm long; lower glume strongly striately nerved throughout *S. nervosum*



Fig. 14. *Sorghum verticilliflorum* (Steud.) Stapf
 Plant $\times \frac{1}{4}$. 1, sessile and pedicelled spikelet; 2, lower glume and 3, upper glume
 of sessile spikelet; 4, grain; all $\times 3$.

4. Glumes of the sessile spikelets thinly crustaceous; spikelets elliptic-lanceolate to elliptic-oblong, 6–11 mm long; pedicelled spikelets large or often reduced, rarely almost suppressed

S. splendidum

1. Sessile spikelets more or less ovate to rotundate, obovate or rhombic, usually less than twice as long as broad when in flower, rarely elliptic or oblong and then broadest above the middle (either when in flower or when in fruit) or with the lower glume wrinkled and depressed across the middle, with the pedicels of the pedicelled spikelets 0.5–2 mm long (rarely 3 mm long in *S. dochma*).

6. Sessile spikelets not transversely wrinkled and depressed about the middle; lower glume coriaceous almost throughout, with the nerves usually more or less obscure except towards the tip, rarely crustaceous and somewhat striately nerved but then with the grains enclosed or almost enclosed and not readily separating from the glumes:—

7. Sessile spikelets obovate, obovate-elliptic or obovate-oblong, at least when in fruit, rarely elliptic or elliptic-oblong when in flower (but then with the panicle loose and comparatively glabrous in appearance owing to the scantiness or shortness of the hairs on all parts and with the pedicelled spikelets persistent on pedicels 0.5–2 mm long); mature grains enclosed, or almost enclosed, or if more exposed then tightly clasped by the glumes:—

8. Glumes of the sessile spikelets often rather thin and somewhat striately nerved to the middle or below the middle; sessile spikelets elliptic to somewhat obovate-elliptic or slightly obovate-oblong, 4–6 (rarely 7) mm long; upper lemma mostly awned; grains similar in shape and size to the sessile spikelets, enclosed or only slightly exposed

S. dochma

8. Glumes of the sessile spikelets coriaceous almost throughout with the nerves obscure except near the tip:—

9. Sessile spikelets broadly obovate, 4–5.5 (rarely 6) mm long, 3–4.5 mm wide, sometimes obovate-rotund to subglobose when in fruit; upper lemma awned; grains 3–4.5 mm long, 2.5–4 mm wide, like the spikelets in shape, enclosed or more often exposed at the top

S. bicolor

9. Sessile spikelets obovate-rotund to obovate-oblong, 3–3.5 mm long and almost as wide; upper lemma mucronate; grains exposed only at the top or sometimes almost to the middle, subglobose, 3–4 mm long and wide

S. miliiforme

7. Sessile spikelets ovate, elliptic, elliptic-oblong or obovate-elliptic to obovate-oblong, 3.5–5.5 mm long, 2–4 mm wide, hairy or almost glabrous, opening to expose one-third to one-half of the grain when mature; mature grains bulging on the back, flat on the face, 3.5–6 mm long, 3–5 mm wide, as long as or more usually much exceeding the more or less adpressed glumes; panicle contracted and dense to compact, sometimes looser but then with the rhachis,

branches and branchlets hairy to villous; pedicelled spikelets persistent or deciduous; pedicels usually 0.2–2 mm long

S. caudatum

6. Sessile spikelets either transversely wrinkled and depressed about the middle (and then with the glumes often thin and papery) or with a large strongly nerved herbaceous tip to the lower glume when in flower, broadly ovate to obovate, obovate-elliptic, obovate-oblong, rhomboid or almost hexagonal; mature grains as long as or more often longer than the glumes and readily separable from them; pedicelled spikelets persistent; pedicels 0.5–2 mm long; panicle usually dense and compact, but sometimes loose; rhachis, branches and branchlets tomentose to villous:—

10. Lower glume of the sessile spikelets coriaceous up to the middle or more, not transversely wrinkled and depressed about the middle; sessile spikelets obovate-elliptic, obovate-oblong, obovate or rhomboid, 4.5–6 mm long, 2.5–6 mm wide; upper lemma mucronate or awned; mature grains 4–6 mm long, 2.5–6 mm wide, biconvex, often with a broad tip

S. durra

10. Lower glume of the sessile spikelets more or less thin and papery and often distinctly transversely wrinkled and depressed about the middle, rarely somewhat thick and spongy in the lower half but then more or less villous and the grains compressed; sessile spikelets 4–6 mm long up to 5 mm wide; upper lemma awned or rarely mucronate:—

11. Sessile spikelets broadly ovate to slightly obovate, usually permanently whitish, villous or at length glabrescent on the thicker portions of the glumes; mature grains subrotund to orbicular, usually much compressed and flattened, more or less exposed

S. cernuum

11. Sessile spikelets oblong to obovate-oblong, broadly obovate-oblong or somewhat hexagonal, more or less hairy when young, but at length glabrescent or sparsely strigose; mature grains much exposed, usually broad and subspherical at the top, more or less compressed and wedge-shaped at the base

S. subglabrescens

1. *Sorghum bicolor* (Linn.) Moench, Meth. Pl. 207 (1794).
Holcus bicolor Linn., Mant. Alt. 301 (1771).
Andropogon bicolor Roxb., Fl. Ind. 1, 272 (1820).

Key to the varieties of *S. bicolor* (Linn.) Moench

1. Sessile spikelets broadly obovate, 4.5–6 mm long, up to 4.5 mm wide when in fruit; lower glume with the depressed tip broadly triangular; pedicelled spikelets persistent on rather stout pedicels:—

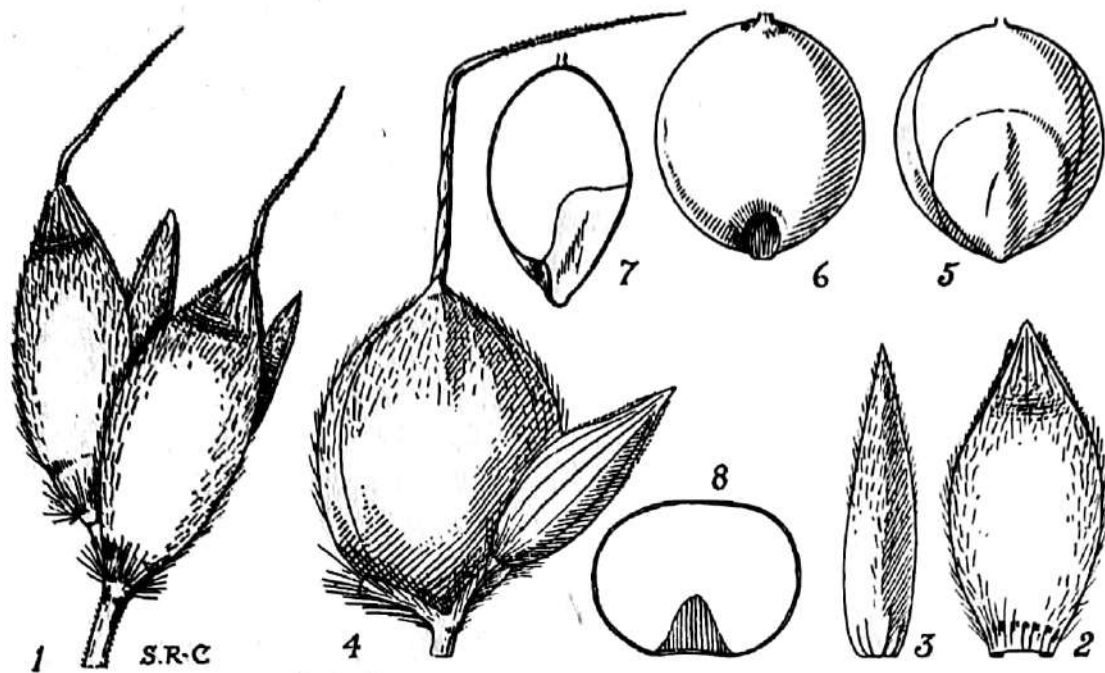


Fig. 15. *Sorghum bicolor* (Linn.) Moench var. *bicolor*.

1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5 and 6, grain; 7, longitudinal section of grain; 8, transverse section of grain; all $\times 6$.

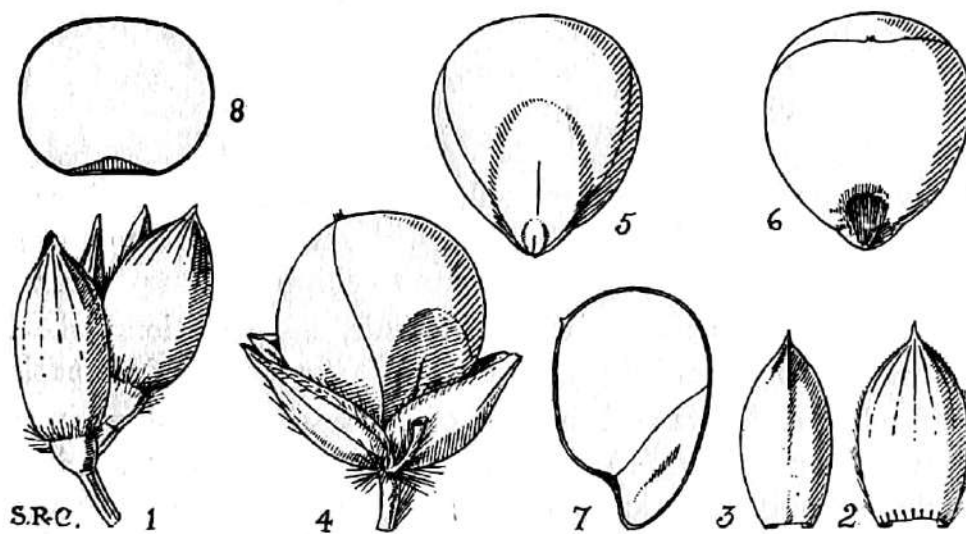


Fig. 16. *Sorghum caudatum* Stapf var. *caudatum*.

1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet; 5 and 6, grain; 7, longitudinal section of grain; 8, transverse section of grain; all $\times 6$.

2. Grains much compressed and flattened, subrotund to orbicular, 4.5–5 mm long and wide, ivory-yellow to cream-buff; panicle oblong to elliptic-oblong
var. *truchmenorum*

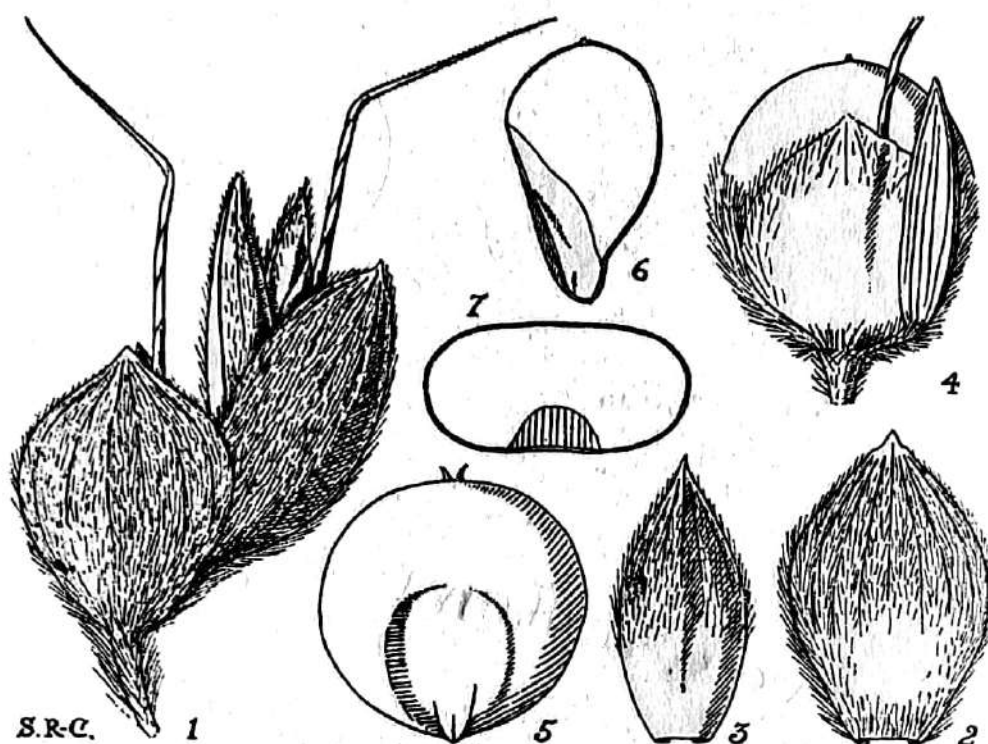


Fig. 17. *Sorghum cernuum* Host var. *globosum* (Hack.) Snowden

1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5, grain; 6, longitudinal section of grain; 7, transverse section of grain; all $\times 6$.

2. Grains moderately compressed, flattened on the embryo-mark, elliptic, 4-4.5 mm long, 3-3.5 mm wide, ivory-yellow to warm buff, cinnamon-buff or red; panicle ovate to elliptic-oblong var. *yemense*
1. Panicle compact, at least when in fruit, 8-20 cm long, the lower branches up to one-third (rarely one-half) the length of the panicle:—
3. Pedicelled spikelets and the tips of the sessile reddish when young; grains cinnamon-buff to apricot-buff, rufous or ferruginous, 4.5-5 mm wide, broadly elliptic to obovate or rotundate; panicle ovate to elliptic-oblong, 8-15 cm long, 4-10 cm wide var. *agricolarum*
3. Pedicelled spikelets and the tips of the sessile not reddish when young; grains ivory-white to yellow or warm buff (rarely cinnamon-buff):—
4. Grains large and much exposed when mature, more or less rotund to orbiculate, 4-5.5 mm long and wide; panicle ovate to elliptic-oblong or oblong, 8-20 cm long, 8-12 cm wide:—
5. Grains moderately compressed and flattened, up to 5.5 mm long and 5 mm wide, soft and mealy almost throughout
var. *globosum*

5. Grains much flattened and compressed, up to 5 mm long and wide, hard and somewhat flinty except towards the centre
var. *orbiculatum*

4. Grains small to medium, elliptic to subrotund or obovate, not much compressed or flattened, usually soft and mealy throughout; panicle 5–15 cm long, 3–8 cm wide:—

6. Grains medium, 3.5–4 mm long and wide; panicle subcylindric, slightly tapering upwards, 5–15 cm long, 4–8 cm wide
var. *subcylindricum*

6. Grains small, 3–3.5 mm long and wide; panicle ovate to elliptic or oblong, often small and somewhat depauperate, 5–10 cm long, 3–5 cm wide
var. *cernuum*

1. **S. cernuum** var. **truchmenorum** (C. Koch) Snowden in Kew Bull. 1935, 251 (1935).

S. truchmenorum C. Koch in Linnaea 21, 442 (1848).

Andropogon sorghum var. *truchmenorum* Koern., Handb. Getreideb. 1, 315 (1885).

Introduced into Madras from Russia and cultivated at Coimbatore.

- ✓ 2. **S. cernuum** var. **yemense** (Koern.) Snowden in Kew Bull. 1935, 251 (1935).

Andropogon sorghum var. *yemensis* Koern. in Bull. Herb. Boiss. 2, App. 2, 11 (1894).

Several forms of the variety are cultivated in Bombay, Madhya Pradesh, Bihar, Orissa and Pepsu.

3. **S. cernuum** var. **agricolarum** (Burkill) Snowden in Kew Bull. 1935, 251 (1935).

Andropogon sorghum var. *agricolarum* Burkill ex Benson and Subba Rao in Madras Dept. Agric. Bull. no. 55, 67 (1906) in part.

Cultivated in central and southern India.

- ✓ 4. **S. cernuum** var. **globosum** (Hack.) Snowden in Kew Bull. 1935, 251 (1935).

Andropogon sorghum subsp. *sativus* var. *globosus* Hack. in DC., Monogr. Phan. 6, 517 (1889).

Cultivated in India in Bombay, Bihar, Uttar Pradesh.

5. **S. cernuum** var. **orbiculatum** Snowden in Kew Bull. 1935, 252 (1935).

Cultivated in Madhya Pradesh.

- ✓ 6. **S. cernuum** var. **subcylindricum** Snowden in Kew Bull. 1935, 252 (1935).

Cultivated in the College Farm, Poona.

7. **S. cernuum** var. **cernuum**.

Cultivated in India (Poona, Uttar and Madhya Pradesh), and in Burma (Rangoon, Hlawga).

4. ***Sorghum conspicuum*** Snowden in Kew Bull. 1935, 226 (1935).

Key to the varieties of *S. conspicuum* Snowden found in India

1. Sessile spikelets glabrous or almost glabrous when mature; mature glumes diamine-brown to blackish-brown or black var. *usaramense*
1. Sessile spikelets permanently hairy or sometimes glabrous on the backs of the glumes when mature; mature glumes dull white to ivory-yellow or cinnamon or mikado-brown var. *orientale*

1. ***S. conspicuum*** var. *usaramense* (Busse et Pilger) Snowden in Kew Bull. 1935, 227 (1935).

Andropogon sorghum var. *usaramense* Busse et Pilger in Engl. Bot. Jahrb. 32, 184 (1902).

Cultivated in Bihar and Orissa.

2. ***S. conspicuum*** var. *orientale* Snowden in Kew Bull. 1935, 227 (1935).

Cultivated in Bihar and Orissa.

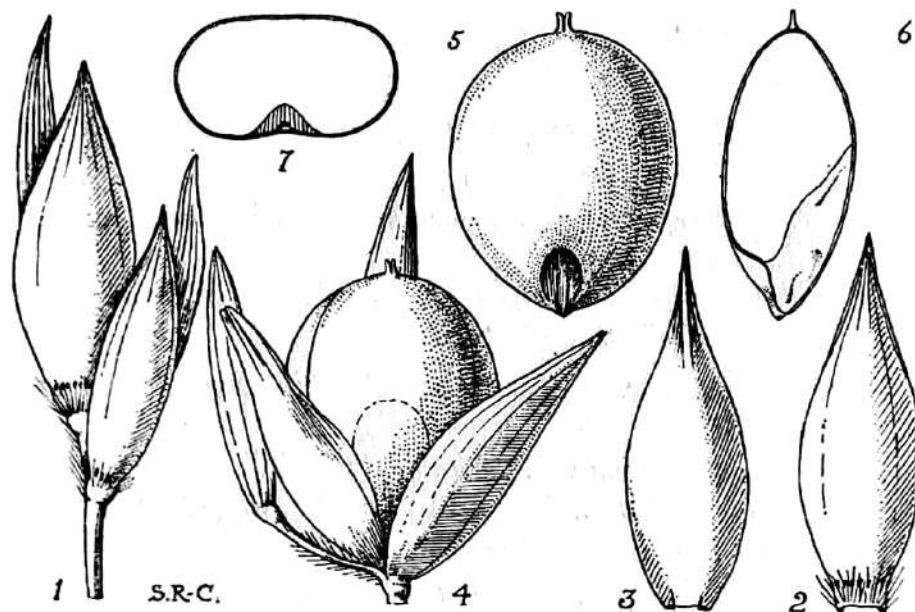


Fig. 18. *Sorghum conspicuum* Snowden var. *conspicuum*.

1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5, grain; 6, longitudinal section of grain; 7, transverse section of grain; all $\times 6$.

5. ***Sorghum dochna*** (Forssk.) Snowden in Kew Bull. 1935, 234 (1935).
Holcus dochna Forssk., Fl. Aegypt.-Arab. 174 (1775).

Andropogon sorghum subsp. *sativus* var. *saccharatus* Hack. in DC., Monogr. Phan. 6, 509 (1889).

Perhaps the most commonly cultivated species in India and Burma.

Key to the varieties of *S. dochna* (Forssk.) Snowden

1. Glumes thin and somewhat papery when in flower, rarely slightly spongy, more crustaceous when in fruit:—

2. Pedicels of the pedicelled spikelets 2 (rarely 3) mm long; sessile spikelets 5.5–6.5 mm long; lower branches longer than half the panicle
var. *pulchrum*
2. Pedicels 0.5–1.5 mm long; sessile spikelet 4.5–5.5 mm long; lower branches usually shorter than half the panicle:—
3. Sessile spikelets sparsely hairy to glabrescent; glumes firmly papery to crustaceous
var. *atrum*
3. Sessile spikelets densely pilose to villous when young, at length glabrescent on the backs; glumes softly papery to spongy
var. *burmanicum*
1. Glumes thinly coriaceous when in flower, crustaceous when in fruit:—
4. Sessile spikelets closed when mature or opening a little near the tips, 4.5–6 mm long:—
5. Panicle with the lower branches almost equal to it in length or exceeding half its length:—
6. Rhachis of the panicle absent or much abbreviated, rarely present and then weak; panicle corymbiform in shape; branches smooth
var. *technicum*
6. Rhachis more or less continuous throughout the whole length of the elliptic-oblong or obovate-oblong panicle; branches coarsely scabrid
var. *obovatum*

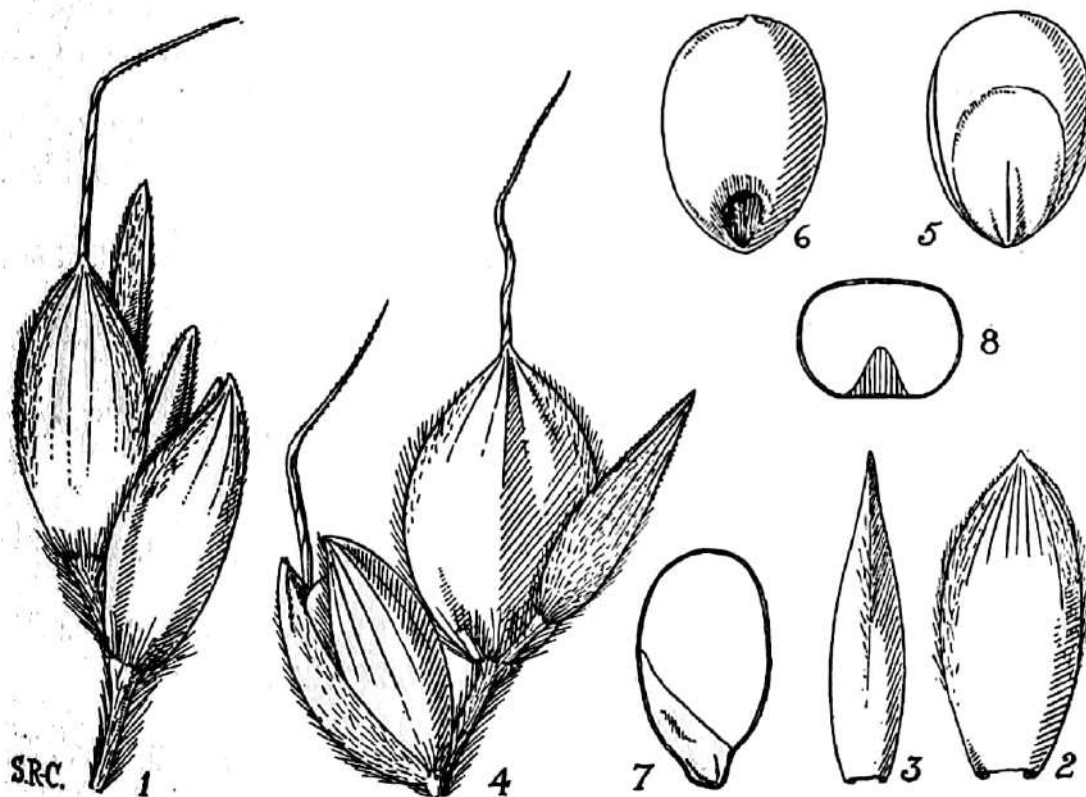


Fig. 19. *Sorghum dochna* (Forssk.) Snowden var. *pulchrum* (Burkill) Snowden
1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile
spikelet; 4, two mature fruiting spikelets and one pedicelled spikelet; 5 and 6
grain; 7, longitudinal section of grain; 8, transverse section of grain; all $\times 7$.

5. Panicle with the lower branches half as long or less than half as long as the panicle var. *irungu*
4. Sessile spikelets when mature opening to expose the tip and sides of the grain to the middle:—
7. Panicle somewhat contracted; sessile spikelets 4.5–5 mm long, 2.5–3 mm wide in fruit; lower branches of panicle less than half as long as the panicle var. *wightii*
7. Panicle loose; sessile spikelets 4.5–5.5 mm long, 3–3.5 mm wide in fruit; lower branches half as long as the panicle or a little longer var. *melliferum*

- ✓ 1. ***S. dochna*** var. ***pulchrum*** (Burkill) Snowden in Kew Bull. 1935, 235 (1935).

Andropogon sorghum var. *pulcher* Burkill ex Benson and Subba Rao in Madras Dept. Agri. Bull. no. 55, 67 (1906) in part. Common in Burma and India.

2. ***S. dochna*** var. ***atrum*** Snowden in Kew Bull. 1935, 235 (1935). Cultivated in Burma and Central India.

There are several forms in which the colour of the grains varies from dull-white to warm-buff and mahogany-red.

3. ***S. dochna*** var. ***burmanicum*** (Burkill) Snowden in Kew Bull. 1935, 235 (1935).

Andropogon sorghum var. *burmanicus* Burkill ex Benson et Subba Rao in Madras Dept. Agric. Bull. n. 55, 67 (1906).

Much more hairy or villous than var. *atrum*. Cultivated in Burma.

- ✓ 4. ***S. dochna*** var. ***technicum*** (Koern.) Snowden in Kew Bull. 1935, 235 (1935).

S. technicum Battand. et Trabut, Fl. Algér. Monocot. 128 (1895).

Andropogon sorghum var. *technicus* Koern. in Syst. Uebers. 20 (1873). Cultivated at Poona.

5. ***S. dochna*** var. ***obovatum*** (Hack.) Snowden in Kew Bull. 1935, 235 (1935).

Sorghum rubens Willd., Enum. Hort. Berol. 1036 (1809).

Andropogon rubens Kunth, Enum. Pl. 1, 502 (1833).

A. sorghum subsp. *sativus* var. *obovatus* Hack. in DC., Monogr. Phan. 6, 514 (1889) in part.

Cultivated at the Govt. Farm, Madras.

6. ***S. dochna*** var. ***irungu*** (Burkill) Snowden in Kew Bull. 1935, 235 (1935).

Andropogon sorghum var. *irungu* Burkill ex Benson et Subba Rao in Madras Dept. Agric. Bull. no. 55, 68 (1906).

Cultivated in Madras.

7. ***S. dochna*** var. ***wightii*** (Hack.) Snowden in Kew Bull. 1935, 236 (1935).

Andropogon sorghum subsp. *sativus* var. *wightii* Hack. in DC., Monogr. Phan. 6, 511 (1889).

Cultivated in India and Burma.

8. *S. dochna* var. *melliferum* Snowden in Kew Bull. 1935, 236 (1935).

Cultivated in India and Burma.

6. *Sorghum durra* (Forssk.) Stapf in Prain, Fl. Trop. Afr. 9, 129 (1917).
Holcus durra Forssk., Fl. Aegypt.-Arab. 174 (1775).
Andropogon sorghum subsp. *sativus* var. *durra* Hack. in DC., Monogr. Phan. 6, 516 (1889).

Key to the varieties of *S. durra* (Forssk.) Stapf

1. Sessile spikelets narrowly obovate, 3 mm wide when in flower, up to 4 mm wide when in fruit; grains 4–5 mm long, 2.5–4.5 mm wide; herbaceous tip of the lower glume long and narrow:—
 2. Herbaceous tip of the lower glume yellow:—
 3. Panicle compact, 5–12 cm long, ovate-elliptic or oblong; grains somewhat loosely held between the glumes var. *mediocre*
 3. Panicle slightly compact to more or less loose, oblong, 15–20 cm long; grains tightly held by the appressed glumes var. *coimbatoricum*
 2. Herbaceous tip of the lower glume not markedly yellow:—
 4. Sessile spikelets obovate with the tip rather short and broad; upper lemma awned; grains dull-white to ivory or red; panicle compact var. *javanicum*
 4. Sessile spikelets obovate-elliptic with a rather long tapering tip; upper lemma usually awned:—
 5. Grains rather large, 4–5.5 mm long, 3.5–4.5 mm wide, usually much exposed when mature owing to the breaking off of the fragile tip of the glumes:—
 6. Panicle ovate, elliptic or elliptic-oblong, compact or rarely somewhat loose, 7–15 (rarely 20) cm long; peduncle erect or goose-necked; sessile spikelets 5.5 mm long:—
 7. Grains white to yellow or rarely ochraceous-tawny; tips of the spikelets not reddish when in flower var. *fecundum*
 7. Grains more or less red; pedicelled spikelets and tips of the sessile spikelets reddish when in flower var. *eois*
 6. Panicle oblong or elliptic-oblong, loose (at least when in flower) 15–35 cm long; peduncle usually erect; sessile spikelets 5–6 mm long; grains sometimes not exceeding the glumes var. *elongatum*
 5. Grains small, 4 mm long, 2.5–3 mm wide, sometimes almost hidden by the tough glumes; panicle compact or almost compact, 7–20 cm long var. *fuscum*
 1. Sessile spikelets broadly ovate to rhomboid, 2.5–4.5 mm wide when in flower, 4–6 mm wide when in fruit:—
 8. Sessile spikelets 2.5–3.5 mm wide when in flower, up to 4 mm wide in fruit; grains 4.5–5 mm long, 3.5–4 mm wide, dull-white to ivory-yellow var. *aegyptiacum*

8. Sessile spikelets 4-4.5 mm wide in flower, 5-6 mm wide in fruit; grains 4-5 mm long and as wide:—
9. Lower glume of sessile spikelet with a short, broad tip, distinctly depressed; grains ivory-yellow to cream-buff or apricot-buff

var. *maximum*

9. Lower glume of sessile spikelet with a rather long herbaceous tip; grains dull-white to buff-yellow or rufous

var. *rivulare*

1. **S. durra** var. **mediocre** (Burkill) Snowden in Kew Bull. 1935, 249 (1935).

Andropogon sorghum var. *mediocris* Burkill ex Benson and Subba Rao in Madras Dept. Agric. Bull. no. 55, 68 (1906) in part.

There are two forms of this variety—one with yellowish, the other reddish glumes. They are both cultivated in Madras.

2. **S. durra** var. **coimbatoricum** (Burkill) Snowden in Kew Bull. 1935, 250 (1935).

Andropogon sorghum var. *coimbatoricum* Burkill ex Benson and Subba Rao in Madras Dept. Agric. Bull. no. 55, 68 (1906).

Cultivated in Madras only.

3. **S. durra** var. **javanicum** (Hack.) Snowden in Kew Bull. 1935, 250 (1935).

Andropogon sorghum subsp. *sativus* var. *javanicus* Hack. in DC., Monogr. Phan. 6, 517 (1889).

Cultivated in Ceylon, north-west and central India.

- ✓ 4. **S. durra** var. **fecundum** Snowden in Kew Bull. 1935, 250 (1935).

This variety is found growing in the hotter and drier parts of Bombay, Sind, Madhya Pradesh.

- ✓ 5. **S. durra** var. **eois** (Burkill) Snowden in Kew Bull. 1935, 250 (1935).

Andropogon sorghum var. *eois* Burkill ex Benson and Subba Rao in Madras Dept. Agric. Bull. no. 55, 67 (1906).

This is merely a colour variety of the last-named—it is cultivated in Bombay.

- ✓ 6. **S. durra** var. **elongatum** Snowden in Kew Bull. 1935, 250 (1935).

Andropogon sorghum vars. *bicolor* and *usorum* Koern. in Bull. Herb. Boiss. 2, App. 2, 11, 12 (1894).

Cultivated in the hotter parts of India, particularly in Bombay, Sind and the Punjab.

- ✓ 7. **S. durra** var. **fuscum** Snowden in Kew Bull. 1935, 250 (1935).

Cultivated in Bombay, Sind, Hyderabad.

- ✓ 8. **S. durra** var. **rivulare** Snowden in Kew Bull. 1935, 251 (1935).

Cultivated in Baluchistan and Bombay.

- ✓ 9. **S. durra** var. **maximum** Snowden in Kew Bull. 1935, 251 (1935).

Cultivated in Bombay and Sind.

- ✓ 10. **Sorghum durra** var. **aegyptiacum** (Koern.) Snowden in Kew Bull. 1935, 249 (1935).

Andropogon sorghum var. *aegyptiacus* Koern. in Mém. Inst. Egypt. 2, 164 (1887).
Cultivated in Bombay.

7. *Sorghum membranaceum* Chiov. in Monogr. Rapp. Col. Roma, no. 19, 23, 24, 27 (1912).
S. papyrascens Stapf in Prain, Fl. Trop. Afr. 9, 134 (1917).

Key to the varieties of *S. membranaceum* Chiov.

1. Grains almost enclosed and hidden by the appressed glumes except where the fragile glumes are broken off:—
 2. Grains white to cream or yellow; sessile spikelets somewhat inflated when mature; pedicelled spikelets and tips of sessile spikelets not reddish when young var. *membranaceum*
 2. Grains salmon-buff to red; sessile spikelets not inflated when mature; pedicelled spikelets and tips of the sessile strongly flushed with red, even when young var. *lateritium*
1. Grains at length much exposed in the upper half owing to the opening of the glumes, white to cream or yellow var. *ehrenbergianum*

1. *S. membranaceum* var. *membranaceum*.

S. membranaceum var. *baldratianum* Chiov. in Monogr. Rapp. Col. Roma, no. 19, 47 (1912).

S. papyrascens var. *vesiculare* Stapf in Prain, Fl. Trop. Afr. 9, 134 (1917).

Cultivated in Bhopal and Rutlam.

2. *S. membranaceum* var. *lateritium* (Stapf) Snowden in Kew Bull. 1935, 231 (1935).

S. papyrascens var. *lateritium* Stapf in Prain, Fl. Trop. Afr. 9, 134 (1917).

Cultivated at Hoshangabad, Madhya Pradesh.

3. *S. membranaceum* var. *ehrenbergianum* (Koern.) Snowden in Kew Bull. 1935, 231 (1935).

Andropogon sorghum var. *ehrenbergianus* Koern. in Mém. Instit. Egypt. 2, 163 (1887).

8. *Sorghum miliiforme* (Hack.) Snowden in Kew Bull. 1935, 237 (1935).
Andropogon sorghum subsp. *sativus* var. *miliiformis* Hack. in DC., Monogr. Phan. 6, 518 (1889).

Key to the varieties of *S. miliiforme* (Hack.) Snowden

1. Grains small, rarely exceeding 3 mm long and wide; panicle usually not more than 15–35 cm long, 10 cm broad:—
 2. Panicle loose or moderately dense, elliptic to elliptic-oblong, 5–10 cm wide; branches slender and flexuous, the lower from one-third to over one-half the length of the panicle; rhachis freely exposed var. *miliiforme*

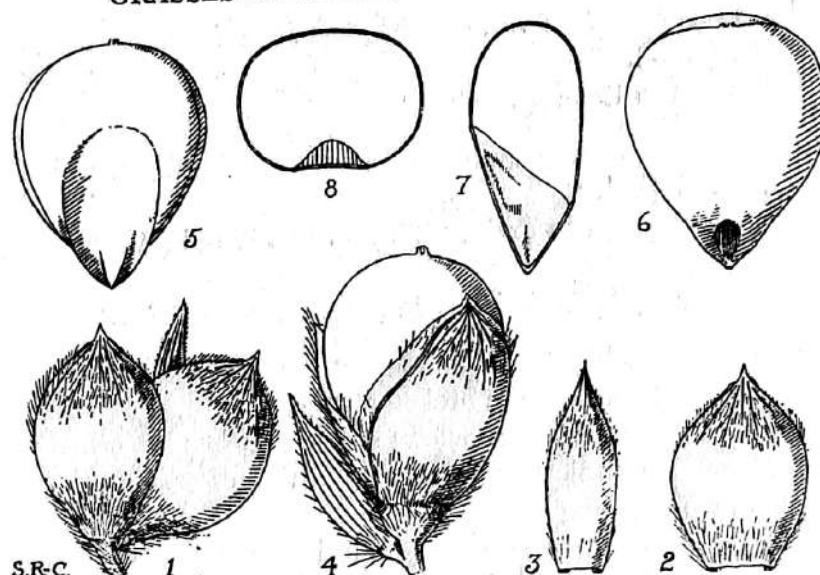


Fig. 20. *Sorghum durra* (Forssk.) Stapf var. *aegyptiacum* (Koern.) Snowden
1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile
spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5 and 6, grain;
7, longitudinal section of grain; 8, transverse section of grain; all $\times 6$.

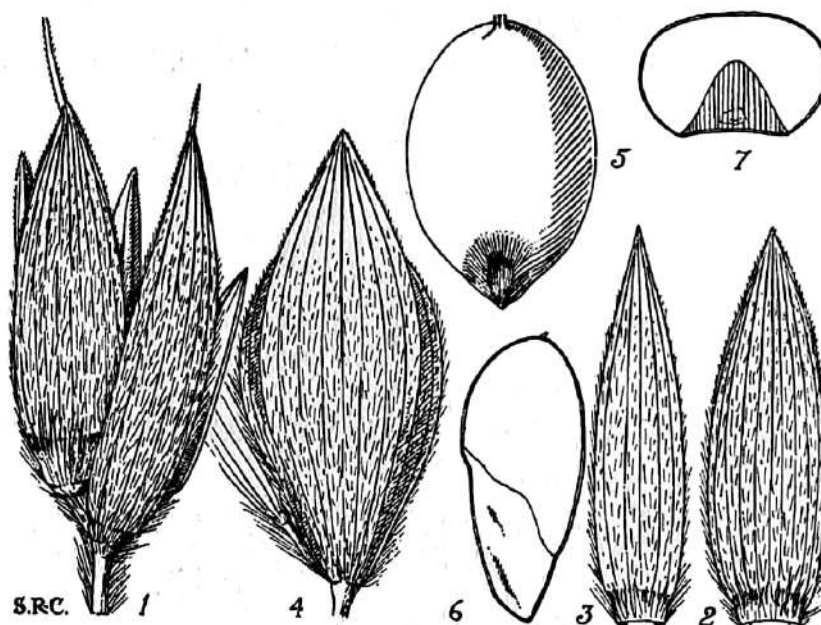


Fig. 21. *Sorghum membranaceum* Chiov. var. *membranaceum*.
1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile
spikelet; 4, mature fruiting spikelet and part of one pedicelled spikelet; 5, grain;
6, longitudinal section of grain; 7, transverse section of grain; all $\times 6$.

2. Panicle more or less contracted and somewhat dense, narrowly oblong to lanceolate-oblong, 4-7 cm wide; branches rather rigid, mostly less than 5 cm long; rhachis often hidden
var. *rotundulum*

1. Grains large, usually 4 mm long and as broad; panicle ovate to ovate-elliptic, 30–35 cm long, 15–20 cm wide; branches slender and flexuous, from 10 cm long to more than half the length of the panicle; rhachis freely exposed

var. *sikkimense*1. *S. miliiforme* var. *miliiforme*.

Andropogon sorghum subsp. *sativus* var. *miliiformis* Hack. in DC., Monogr. Phan. 6, 518 (1889).

Cultivated in Sikkim and Darjeeling District.

✓ 2. *S. miliiforme* var. *rotundulum* Snowden in Kew Bull. 1935, 237 (1935).

Cultivated in Bihar, Orissa, Bengal and Assam (Lushai Hills).

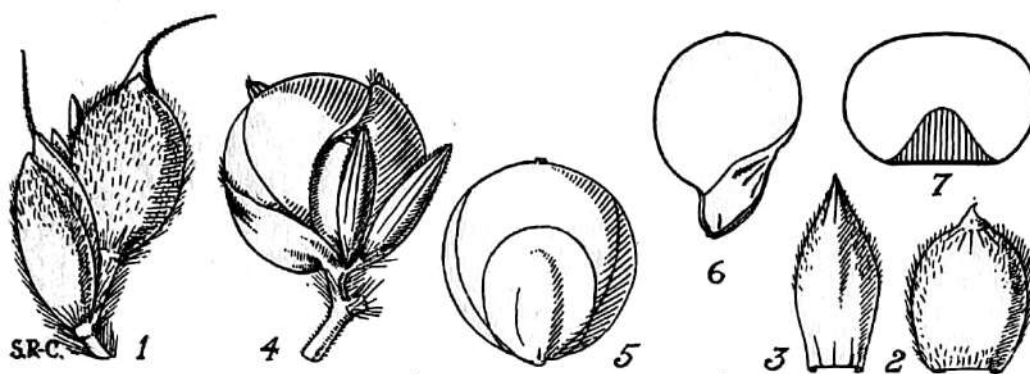


Fig. 22. *Sorghum miliiforme* (Hack.) Snowden var. *miliiforme*.

1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and two pedicelled spikelets; 5, grain; 6, longitudinal section of grain; 7, transverse section of grain; all $\times 6$.

3. *S. miliiforme* var. *sikkimense* Snowden in Kew Bull. 1935, 237 (1935).

Cultivated in Sikkim.

9. *Sorghum nervosum* Bess. ex Schult. in Roem. et Schult. Syst. Veg. 2, Mant. 669 (1827).

Andropogon besseri Kunth, R  v. Gram. 1, 166 (1829).

Cultivated in Bihar and Orissa, where it has been introduced from Manchuria (teste Snowden).

10. *Sorghum roxburghii* Stapf in Prain, Fl. Trop. Afr. 9, 126 (1917).

Key to the varieties of *S. roxburghii* Stapf

1. Sessile spikelets more or less permanently hairy:—
 2. Sessile spikelets lanceolate; lower glumes coriaceous almost to the tip
var. *parvum*
 2. Sessile spikelet ovate-lanceolate to ovate; lower glume coriaceous in the lower two-thirds
var. *fulvum*

R

1. Sessile spikelets at length more or less glabrous and glossy on the backs:—

3. Culms tall, insipid; nucellar layer white to ivory

var. *hians*

3. Culms dwarf, sweet; nucellar layer dark-vinaceous

var. *nanum*

1. *S. roxburghii* var. *parvum* Snowden in Kew Bull. 1935, 228 (1935).

Cultivated in Burma at the Mandalay Farm.

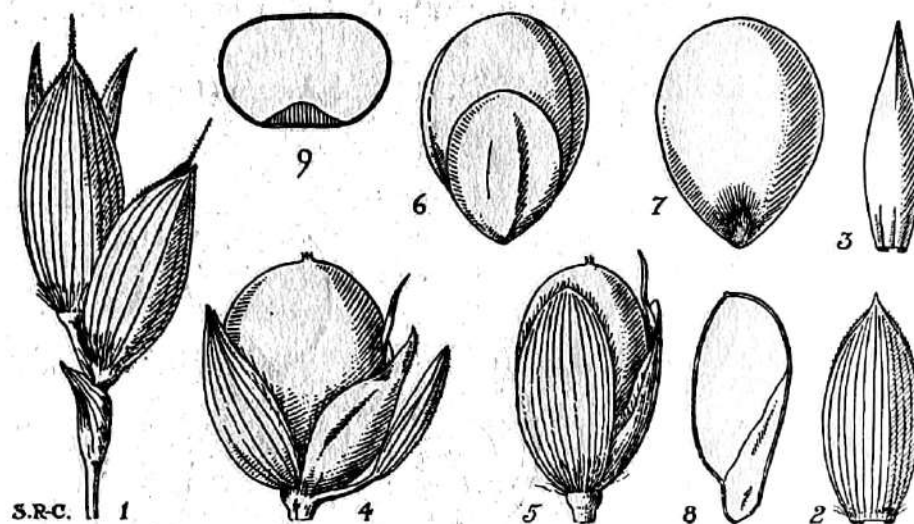


Fig. 23. *Sorghum nervosum* Bess. ex Schult. var. *nervosum*
1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5, mature fruiting spikelet; 6 and 7, grain; 8, longitudinal section of grain; 9, transverse section of grain; all $\times 6$.

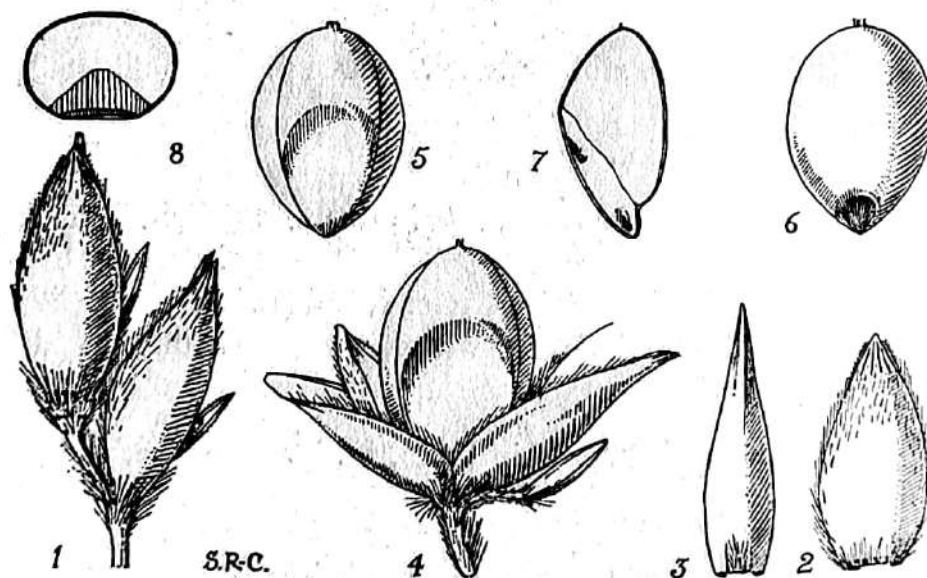


Fig. 24. *Sorghum roxburghii* Stapf var. *hians* Stapf
1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5 and 6, grain; 7, longitudinal section of grain; 8, transverse section of grain; all $\times 6$.

2. *S. roxburghii* var. *fulvum* (Hack.) Snowden loc. cit.
S. roxburghii var. *semiclausum* Stapf in Prain, Fl. Trop. Afr. 9, 127 (1917) in part.
Andropogon sorghum subsp. *sativus* var. *fulvus* Hack. in DC., Monogr. Phan. 6, 512 (1889).

A form with dull-white to ivory-yellow grains is cultivated in Burma, and in India a form with cinnamon-rufous or rufous grains.

3. *S. roxburghii* var. *hians* Stapf in Prain, Fl. Trop. Afr. 9, 127 (1917).
Andropogon sorghum var. *hians* Stapf in Hook. f., Fl. Brit. Ind. 7, 184 (1896).

Cultivated in India and Burma.

4. *S. roxburghii* var. *nanum* Snowden in Kew Bull. 1935, 228 (1935).

Cultivated in Bihar and Orissa.

11. *Sorghum splendidum* (Hack.) Snowden in Kew Bull. 1935, 233 (1935).

Andropogon sorghum subsp. *sativus* var. *splendidus* Hack. in DC., Monogr. Phan. 6, 510 (1889).

This species is cultivated in Burma.

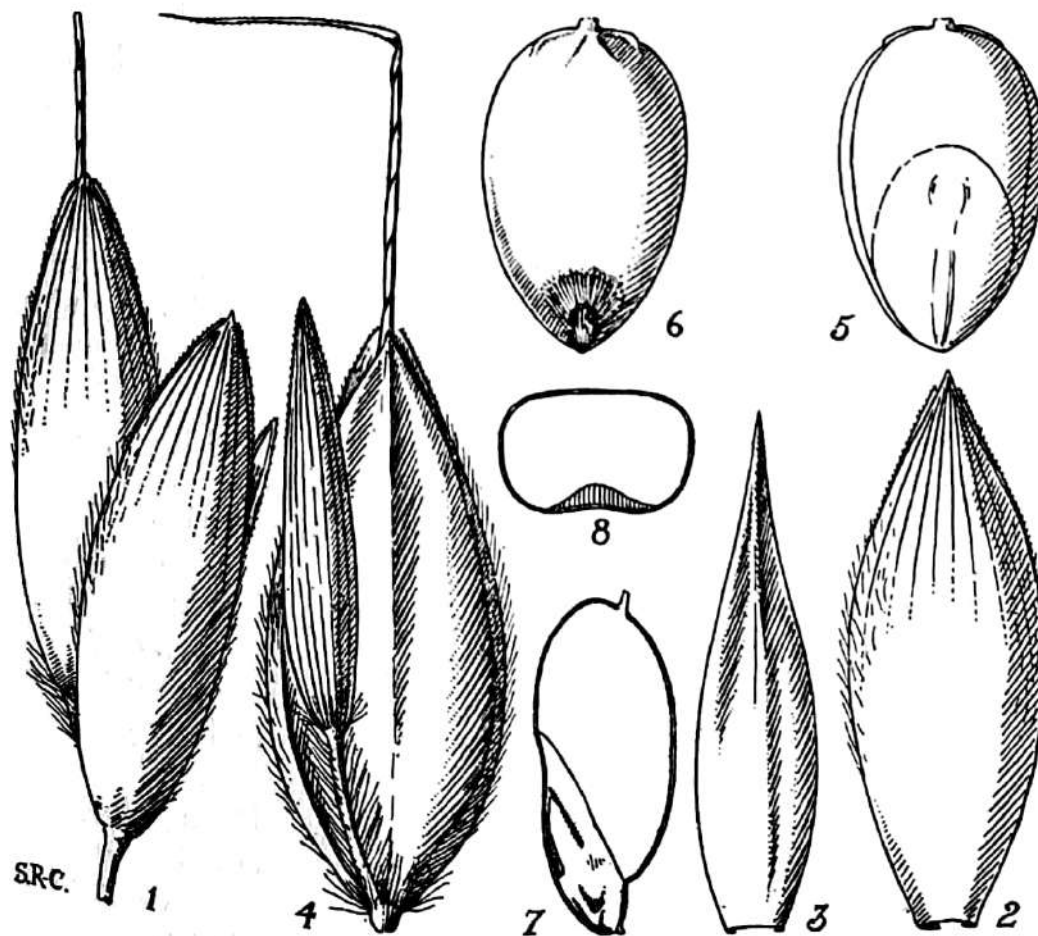


Fig. 25. *Sorghum splendidum* (Hack.) Snowden
 1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5 and 6, grain; 7, longitudinal section of grain; 8, transverse section of grain; all $\times 6$.

12. *Sorghum subglabrescens* (Steud.) Schweinf. et Aschers. in Schweinf., Beitr. Fl. Aethiop. 302, 306 (1867).

Andropogon subglabrescens Steud., Syn. Pl. Glum. 1, 393 (1854).

A. sorghum subsp. *sativus* var. *subglabrescens* Hack. in DC., Monogr. Phan. 6, 519 (1889).

Key to the varieties of *S. subglabrescens* Schweinf. et Aschers.

1. Panicle remaining more or less loose even when in fruit; rhachis freely exposed; branches long, slender and flexuous except near the base, rarely shorter in depauperate panicles:—
 2. Leaves somewhat narrow, rarely more than 4 cm wide, often less; panicle sometimes rather contracted and depauperate, 10–20 cm wide; grains small, up to 4 mm long and 3 mm wide var. *pabulare*
 2. Leaves usually 5–8 cm or more wide; panicle 20–35 cm long (except when depauperate), 6–12 cm wide:—
 4. Grains dark-coloured, ochraceous-tawny, cinnamon-rufous, hazel or dark livid-brown; nucellar layer usually light- to dark-vinaceous drab var. *rugulosum*
 4. Grains dull white to cream colour or light buff; nucellar layer usually colourless or absent var. *paniculatellum*
1. Panicle contracted, more or less dense and compact, at least when in fruit; rhachis hidden completely or almost so throughout; branches suberect, rather stiff and rigid; upper lemma of the sessile spikelets awned or rarely mucronate:—
 5. Grains 2.3–4 mm wide; glumes of the sessile spikelets thin and papery except for the somewhat thicker basal portion and sometimes a small part below the tip, hairy when young, almost glabrous when mature:—
 6. Panicle oblong or almost oblong, 12–30 cm long, 4–10 cm wide; grains 3.5–4.5 mm long, much exposed and overtopping the glumes:—
 7. Pedicelled spikelets and the tips of the sessile usually either decidedly reddish or yellowish even when young:—
 8. Tips of the spikelets decidedly reddish; grains red var. *rubidum*
 8. Tips of the spikelets usually decidedly yellowish; grains more or less yellow var. *compactum*
 7. Pedicelled spikelets and the tips of the sessile not reddish or yellowish when young; grains dull-white to ivory-yellow or warm buff var. *irungiforme*
 6. Panicle more or less ovoid, 10–15 cm long, 6–10 cm wide; grains 3.7–5 mm long, 2.3–4 mm wide, white, yellow or red var. *oviforme*
 5. Grains 3.5–5 mm wide; glumes of the sessile spikelets somewhat papery to subcoriaceous except for the coriaceous base and sometimes a portion below the tip, sparsely hairy and at length glabrous except sometimes near the tips:—

9. Grains white, yellow or red var. *latum*
9. Grains warm-buff to ochraceous-salmon var. *subglabrescens*
- ✓ 1. ***S. subglabrescens* var. *pabulare*** Snowden in Kew Bull. 1935, 252 (1935).
Cultivated at the Poona College Farm.
2. ***S. subglabrescens* var. *rugulosum* (Hack.)** Snowden in Kew Bull. 1935, 252 (1935).
Andropogon sorghum subsp. *sativus* var. *rugulosus* Hack. in DC., Monogr. Phan. 6, 508 (1889).
Cultivated at the Nagpur Farm, Madhya Pradesh.
- ✓ 3. ***S. subglabrescens* var. *paniculatellum* (Chiov.)** Snowden in Kew Bull. 1935, 253 (1935).
S. basiplicatum var. *paniculatellum* Chiov. in Monogr. Rapp. Colon. Roma, no. 19, 38 (1912).
Cultivated at the Poona College Farm.
- ✓ 4. ***S. subglabrescens* var. *rubidum* (Burkill)** Snowden in Kew Bull. 1935, 253 (1935).
Andropogon sorghum var. *irungiformis* subvar. *rubidus* and var. *mediocris* subvar. *ruber* Burkill ex Benson et Subba Rao in Madras Dept. Agric. Bull. no. 55, 68, 69 (1906).
Cultivated in Madras at several centres.
- ✓ 5. ***S. subglabrescens* var. *compactum* (Burkill)** Snowden in Kew Bull. 1935, 253 (1935).
Andropogon sorghum var. *compactus* Burkill ex Benson et Subba Rao in Madras Dept. Agric. Bull. no. 55, 67, 69 (1906) in part, also var. *irungiformis* subvar. *sulphureus* and var. *mediocris* subvar. *fuscescens* Burkill l.c.
Cultivated at several centres in Madras, and at Nagpur and Wardha in Madhya Pradesh.
- ✓ 6. ***S. subglabrescens* var. *irungiforme* (Burkill)** Snowden in Kew Bull. 1935, 253 (1935).
Andropogon sorghum var. *irungiformis* subvar. *pallidus* et var. *mediocris* subvar. *fuscescens* (in part) Burkill ex Benson et Subba Rao in Madras Dept. Agric. Bull. no. 55, 69 (1906).
Cultivated in Madras and Bombay States.
- ✓ 7. ***S. subglabrescens* var. *oviforme*** Snowden in Kew Bull. 1935, 254 (1935).
Cultivated in several places in Madras, Bombay and Madhya Pradesh.
- ✓ 8. ***S. subglabrescens* var. *latum*** Snowden in Kew Bull. 1935, 255 (1935).
Cultivated at the Poona College Farm.
9. ***S. subglabrescens* var. *subglabrescens*.**
Cultivated in the Punjab.

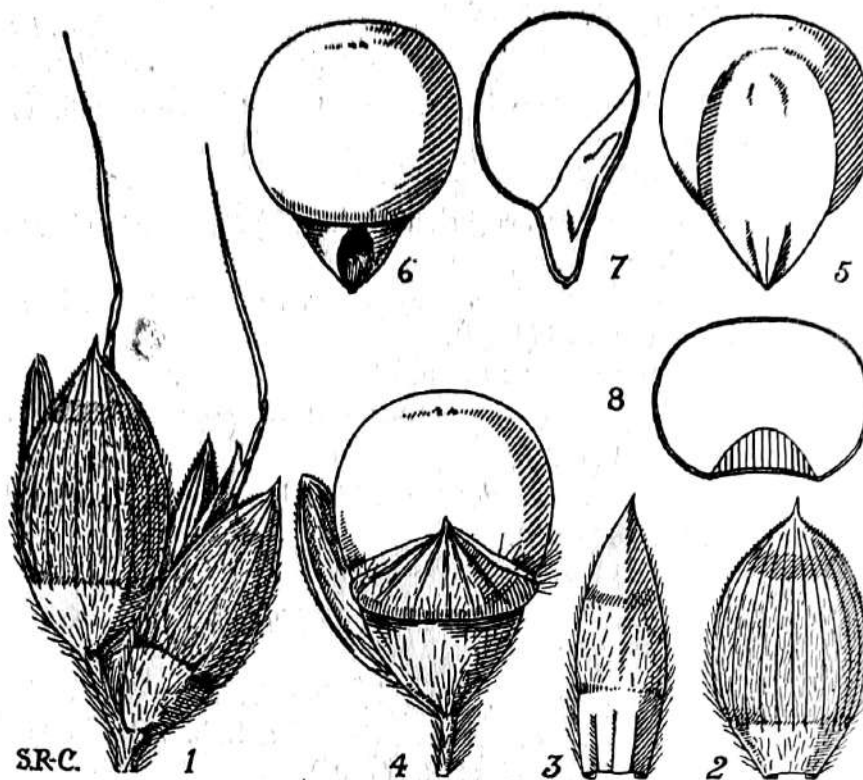


Fig. 26. *Sorghum subglabrescens* (Steud.) Schweinf. et Aschers. var. *subglabrescens*. 1, part of raceme; 2, lower glume of sessile spikelet; 3, upper glume of sessile spikelet; 4, mature fruiting spikelet and one pedicelled spikelet; 5 and 6, grain; 7, longitudinal section of grain; 8, transverse section of grain; all $\times 6$.

Sect. *Parasorghum* Snowden

Key to the species of *Sorghum* sect. *Parasorghum*

1. Pedicelled spikelets much smaller than the sessile, narrowly linear, sterile and usually reduced to the glumes; sessile spikelets 7-7.5 mm long, 2.5 mm wide, elliptic-lanceolate, densely white-strigose *S. stapfii*
1. Pedicelled spikelets similar to, or not much smaller than, the sessile, usually linear-lanceolate:—
 2. Sessile spikelet 4-5.5 mm long, 1-1.5 mm wide; awn of the spikelet, if present, slender, not more than 25 mm long:—
 3. Sessile spikelets elliptic-oblong to ovate-oblong, sparingly strigose, at length light to dark brown and glossy on the exposed parts, awned or awnless; upper glume strigosely hairy above the middle *S. nitidum*
 3. Sessile spikelets elliptic-lanceolate, brown to brownish-purple, awned; lower glume villous with hairs 1-2 mm long arising from minute tubercles; upper glume glabrous except for the finely ciliate hyaline margins *S. burmahicum*
 2. Sessile spikelets 6-10 mm long, 1.5-3 mm wide:—

4. Sessile spikelets 7.5–10 mm long, 2–3 mm wide, glabrous, or if hairy, with hairs 3–4 mm long:—
5. Sessile spikelets 8–10 mm long, elliptic-lanceolate, coarsely ciliate along the involute margins of the glumes, otherwise for the most part glabrous; lower glume with a narrow raised semi-cylindrical beak-like tip, bordered by thin, rather wide-marginate keels which end in rather blunt teeth below the narrowly truncate apex; keels spinulously ciliate *S. purpureo-sericeum*
5. Sessile spikelets 7.5–8.5 mm long, elliptically flask-shaped, densely and coarsely hirsute with hairs 3–4 mm long; lower glume narrowed upwards into a beak-like tip in the upper fourth without a keel or very narrowly keeled in the upper part of the neck below the minutely 2-toothed apex *S. deccanense*
4. Sessile spikelets 6–8 mm long, 1.5–2 mm wide, lanceolate to lanceolate-oblong, more or less densely hairy with appressed hairs 0.5–1 mm long or at length glabrescent; lower glume finely but distinctly keeled for 2 mm near the subacute apex, with the keels spinously ciliolate and ending in minute teeth *S. leiocladum*

1. *Sorghum burmahicum* Raiz. in Indian For. 83, 315 (1957).

Distribution: Burma, extending to Southeast Asia.

Exsicc.—Parkinson 15608, Burma (type, Dehra Dun); Po Khant 1839, Hlawga Lake, Burma.

- ✓ 2. *Sorghum deccanense* Stapf, sp. nov., cum *S. purpureo-sericeo* Aschers. et Schweinf. comparandum sed ab eo apice glumae inferioris cylindrico haud carinato vel explanato inter alia recedit.
Distribution: Endemic in Madhya Pradesh and in Western India.
Exsicc.—J. F. Duthie 8538, 10025, Madhya Pradesh; Woodrow s.n., Deccan.

3. *Sorghum leiocladum* (Hack.) C. E. Hubb. in Hook., Icon. Pl. (1938), t. 3364.

Andropogon australis Spreng. subsp. *leiocladus* Hack. in DC., Monogr. Phan. 6, 524 (1889).

Distribution: Australia.

This species has been introduced into India.

4. *Sorghum nitidum* (Vahl) Pers., Syn. Pl. 1, 101 (1805).

Andropogon serratus Thunb., Fl. Jap. 41 (1784).

Holcus nitidus Vahl, Symb. Bot. 2, 102 (1791).

H. fulvus R.Br., Prodr. 199 (1810).

Sorghum fulvum (R.Br.) P. Beauv., Ess. Agrost. 164 (1812).

Andropogon tropicus Spreng., Syst. Veg. 1, 287 (1825).

Sorghum tropicum (Spreng.) Büse in Miq., Pl. Junghn. 359 (1854).

S. serratum (Thunb.) O. Ktze., Rev. Gen. Pl. 2, 792 (1891) non Roem. et Schult. (1817).

Distribution: India, Ceylon, Burma, extending through Siam and Indo-China to Australia. $2n = 20$.

This species is to be found in awned and unawned forms.

Exsicc.—*N. L. Bor* 6522, Naga Hills (unawned); *H. H. Haines* 5319, Bihar (awned); *Bourne* 1528, Madras (unawned); *J. H. Lace* 4371, Burma (awned); *Thwaites* C.P. 419, Ceylon (unawned).

- ✓ 5. ***Sorghum purpureo-sericeum* (Hochst.) Aschers. et Schweinf.** in Schweinf., Beitr. Fl. Aethiop. 310 (1867).

Andropogon purpureo-sericeus Hochst. ex A. Rich., Tent. Fl. Abyss. 2, 469 (1851).

Distribution: East and north-east Africa, Bombay.

Exsicc.—*A. P. Young* s.n., North Kanara. $2n = 10$.

This species is said to give very large yields when cultivated, to be liked by cattle, to resist drought and suppress *Heteropogon contortus*.

6. ***Sorghum stapfii* (Hook. f.) C. E. C. Fischer** in Gamble, Fl. Madras 1735 (1934).

Andropogon stapfii Hook. f., Fl. Brit. Ind. 7, 184 (1896).

Distribution: Madras.

Little is known of this attractive species.

Exsicc.—*Herb. Wight* s.n., Madras.

***Spodiopogon* Trin., Fund. Agrost. 192 (1820), t. 17.**

Key to the species of *Spodiopogon*

1. Leaves petioled:—

2. Base of the elliptic leaf-blade tapering to the petiole; inflorescence of a few racemes of spikelets densely covered with white hairs

S. rhizophorus

2. Base of the linear-acuminate leaf-blade sagittate; inflorescence a true panicle; spikelets not white-hairy

S. lacei

1. Leaves linear-acuminate, rounded at the base to the sheath; inflorescence a true panicle, often dense

S. dubius

1. ***Spodiopogon dubius* Hack.** in DC., Monogr. Phan. 6, 186 (1889).

Distribution: Temperate Himalaya from the north-west to Tehri Garhwal.

This is a leafy species and must have some fodder value.

Exsicc.—*T. Thoms.*, West Himalaya, Simla.

2. ***Spodiopogon lacei* Hole** in Indian For. Rec. 5, 6, 185 (1915).

Distribution: Burma and Assam (Manipur State).

Grows gregariously on open hillsides.

Exsicc.—*Lace* 4372, Burma; *N. L. Bor* 18518, Manipur.

- ✓ 3. ***Spodiopogon rhizophorus* (Steud.) Pilger** in Engler & Prantl, Natürl. Pflanzenf. Aufl. 2, 14e, 119 (1940).

Andropogon albidus Wall., Cat. n. 8821 (1829), Herb. Heyne., nomen.

Andropogon rhizophorus Steud., Syn. Pl. Glum. 1, 381 (1854).

Spodiopogon albidus (Wall.) Benth. in J. Linn. Soc. (Bot.) 19, 66 (1881).

Distribution: Western parts of Madras and Bombay States.

This is a very leafy species often found in the openings in heavy forest where it grows gregariously, covering considerable areas.

Exsicc.—Wallich 8821, Madras.

***Thaumastochloa* C. E. Hubb. in Hook. Ic. Pl.**

(1936), t. 3313, 3314.

1. ***Thaumastochloa cochinchinensis* (Lour.) C. E. Hubb. in Hook. Icon. Pl. sub tab. 3313, 3314 (1936).**

Phleum cochinchinense Lour., Fl. Cochinch. 1, 48 (1790).

Ophiuros monostachyus J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 330 (1830).

Ophiuros undatus Nees in Hook., Kew J. Bot. 2, 100 (1850).

Distribution: India, Burma, Siam, China, extending to the Philippines, but nowhere very abundant.

Kneucker remarks with regard to this grass: "Dämme der Reisfelder, zerstreut, lockig, buschig und schwer auffindbar, weil die Art vielfach mit anderen Gräsern usw. vermischt ist. Dies ist wohl auch ein Grund warum die Art selten gesammelt wurde."

Exsicc.—C. B. Clarke 33807, Hazaribagh.

***Thelepogon* Roth ex Roem. et Schult., Syst.**

Veg. 2, 46, 788 (1817).

✓ 1. ***Thelepogon elegans* Roth ex Roem. et Schult., Syst. Veg. 2, 788 (1817).**

Andropogon princeps A. Rich., Tent. Fl. Abyss. 2, 470 (1851).

Rhynchosyris princeps (A. Rich.) Hochst. ex Steud., Syn. Pl. Glum. 1, 360 (1854).

Jardinea abyssinica Steud., loc. cit. 360.

Distribution: Madhya Pradesh, Bombay, Madras, also in Tropical Africa.

This is reported to be a very bitter grass but it is eaten by horses, possibly in default of anything better. It is a gregarious species and according to Blatter is very abundant on the "bunds" between the rice-fields in the Carnatic.

Exsicc.—J. F. Duthie 8518, Madhya Pradesh; Dalzell s.n., Bombay; Law s.n., Concan.

Themeda Forssk., Fl. Aegypt.-Arab. 178 (1775).

Anthistiria Linn. f., Nov. Gram. Gen. 35 (1779).

Perobachne J. S. Presl ex C. B. Presl, Rel. Haenk.
1, 348 (1830), t. 48.

Androscepia Brongn. in Duperr., Voy. Coquille Bot.
77 (1831).

Key to the species and varieties of *Themeda*

1. Pairs of involucre spikelets inserted at different levels:—
 2. Involucre spikelets entirely glabrous or puberulous but without tubercle-based hairs:—
 3. Involucre spikelets puberulous with very short hairs on the lower glumes:—
 4. Fertile spikelets with an imperfect awn or awnless
Th. villosa
 4. Fertile spikelets with a well-developed awn:—
 5. Involucre spikelets 10–15 mm long; false racemes 2–3 together
Th. caudata
 5. Involucre spikelets 20–22 mm long; false racemes solitary
Th. longispatha
 3. Involucre spikelets entirely glabrous:—
 6. Inflorescence of a solitary compound raceme terminating the unbranched culm
Th. saxicola
 6. Inflorescence of few to very many compound racemes:—
 7. Inflorescence usually very large; involucre spikelets 4–6 mm long
Th. cymbaria
 7. Inflorescence simple, of few racemes; involucre spikelets 13–19 mm long
Th. hookeri
 2. Involucre spikelets covered on the lower glume with numerous or sparse tubercle-based bristles:—
 8. Sessile spikelets not awned:—
 9. Robust tall grass; involucre spikelets 10–12 mm long, covered with golden hairs; sessile spikelet dark brown, 8 mm long
Th. x intermedia
 9. Weak erect grass with small spikelets; involucre spikelets 4.5–8 mm long, covered with grey hairs; sessile spikelets pale, 5 mm long
Th. anathera
 8. Sessile spikelets awned:—
 10. Racemes less than 1.5 cm long:—
 11. A wiry, bushy, low grass, much branched; involucre spikelets 10–11 mm long; hermaphrodite spikelets usually two
Th. huttonensis
 11. An erect unbranched grass; involucre spikelets 9 mm long; hermaphrodite spikelets only one
Th. triandra
 10. Racemes much more than 1.5 cm long:—

12. Tall robust grasses with nodding panicles and tubercle-based golden hairs on the lower glumes of the involucre spikelets; awns stout:—
 13. Awns with a column 3.75–7 cm long; involucre spikelets 12–20 mm long *Th. arundinacea*
 13. Awns with a column 2.5 cm or less long; involucre spikelets 11–12 mm long *Th. x subsericans*
12. Weak but not wiry, bushy grasses or if robust the hairs on the lower glumes of the involucre spikelets always grey; awns slender:—
 14. Peduncles of the racemes up to 5 cm long; racemes solitary; inflorescence simple *Th. mooneyi*
 14. Peduncles of the racemes very short, less than 1 cm long; racemes more or less glomerate; inflorescence compound; lower glume of fertile spikelet dorsally channelled *Th. tremula*
1. Pairs of involucre spikelets inserted at the same level:—
 15. Spikelets arranged in large flabelliform clusters 4–5 cm long excluding awns; awns 5–7 cm long; an annual or occasionally perennial *Th. arguens*
 15. Spikelets arranged in much smaller clusters; awns much shorter; annuals or perennials:—
 16. Involucre spikelets over 6 mm long, glabrous or with sparse tubercle-based hairs; awns up to 6 cm long; panicle of congested heads loosely arranged *Th. triandra*
 16. Involucre spikelets less than 6 mm long; awns shorter; lower glumes sparsely to densely strigose:—
 17. Panicle very loose, leafy; awn about 3.5 cm long *Th. laxa*
 17. Panicles more or less densely congested, not leafy:—
 18. Lower glumes of involucre spikelets very densely strigose all over *Th. strigosa*
 18. Lower glumes of involucre spikelets not densely strigose but with tubercle-based hairs mostly toward the tip:—
 19. Robust plants; lower glume of the hermaphrodite spikelet glabrous along the middle line *Th. quadrivalvis* var. *quadrivalvis*
 19. Dwarf plants 30–45 cm tall; lower glume of the hermaphrodite spikelet strigulose on the back *Th. quadrivalvis* var. *helferi*

1. ***Themeda anathera*** (Nees) Hack. in DC., Monogr. Phan. 6, 669 (1889).

Anthistiria anathera Nees ex Royle, Ill. Bot. Himal. 417 (1839) nomen nudum; Nees ex Steud., Syn. Pl. Glum. 1, 402 (1855), descr.

Androscepiia anathera Anderss. in Nov. Act. Sc. Upsal. sér. 3, 2, 249 (1856).



Fig. 27. *Themeda triandra* Forssk.
 Plant $\times \frac{1}{4}$. 1, ligule; 2, group of spikelets showing 2a, involucral sterile or male spikelets; 2b, hermaphrodite awned spikelet and 2c, one of two pedicelled spikelets $\times 2$; 3, hermaphrodite and pedicelled spikelets $\times 4$.

contain an appreciable amount of sugar and are very acceptable to grazing animals; when older they become very coarse and of very doubtful use as fodder. This species is excellent for paper but is difficult to bleach.
Exsicc.—A. A. Bullock 688, Manipur; J. S. Gamble 10565, Bengal.

Thyrsia Stapf in Prain, Fl. Trop. Afr. 9, 48 (1917).

1. **Thyrsia zea** (Clarke) Stapf in Hook. Ic. Pl. (1922) sub. tab. 3078.
Rottboellia zea C. B. Clarke in J. Linn. Soc. (Bot.) 25, 86 (1889) t. 35.
R. thyrsioidea Hack. in DC., Monogr. Phan. 6, 283 (1889).
Thyrsia thyrsioidea (Hack.) A. Camus in Bull. Mus. Hist. Nat. Paris 27, 369 (1921).

Distribution: Plains and hills of Assam, East Bengal and Burma. Also found in Indo-China.

A reed-like grass found in dry situations. It is not of any account as a fodder grass.

Although Clarke's specific name and that of Hackel were published in the same year, viz. 1889, Clarke's has priority as acknowledged by Hackel in DC., Monogr. Phan. 6, 690 (1889). Clarke's name appeared in February of that year, Hackel's in April.

Exsicc.—N. L. Bor 12, Naga Hills; J. H. Lace 5538, Burma; J. M. Cowan s.n., Darjeeling.

Triplopogon Bor in Kew Bull. 1954, 51 (1954).

- ✓ 1. **Triplopogon ramosissimus** (Hack.) Bor in Kew Bull. 1954, 501 (1954).

Ischaemum ramosissimum Hack. in DC., Monogr. Phan. 6, 249 (1889).

I. spathiflorum Hook. f., Fl. Brit. Ind. 7, 138 (1896).

Sehima spathiflorum (Hook. f.) Blatt. et McCann in J. Bombay Nat. Hist. Soc. 32, 23 (1927).

Triplopogon spathiflorus (Hook. f.) Bor in Kew Bull. 1954, 54 (1954).

Distribution: Seems to be endemic to Bombay.

This is a grass which can reach a height of 4 m in favourable circumstances. When grown at Kew it developed stilt roots at the lower nodes upon which the grass held itself erect, the primary root having disappeared. This also appears to be the habit of the plant in its native home, but the point needs to be checked. It would be an interesting study for some post-graduate student to find out under what circumstances this and certain other grasses assume the *Rhizophora*-habit.

Exsicc.—Type at Kew (Jacquemont 797, Bombay).

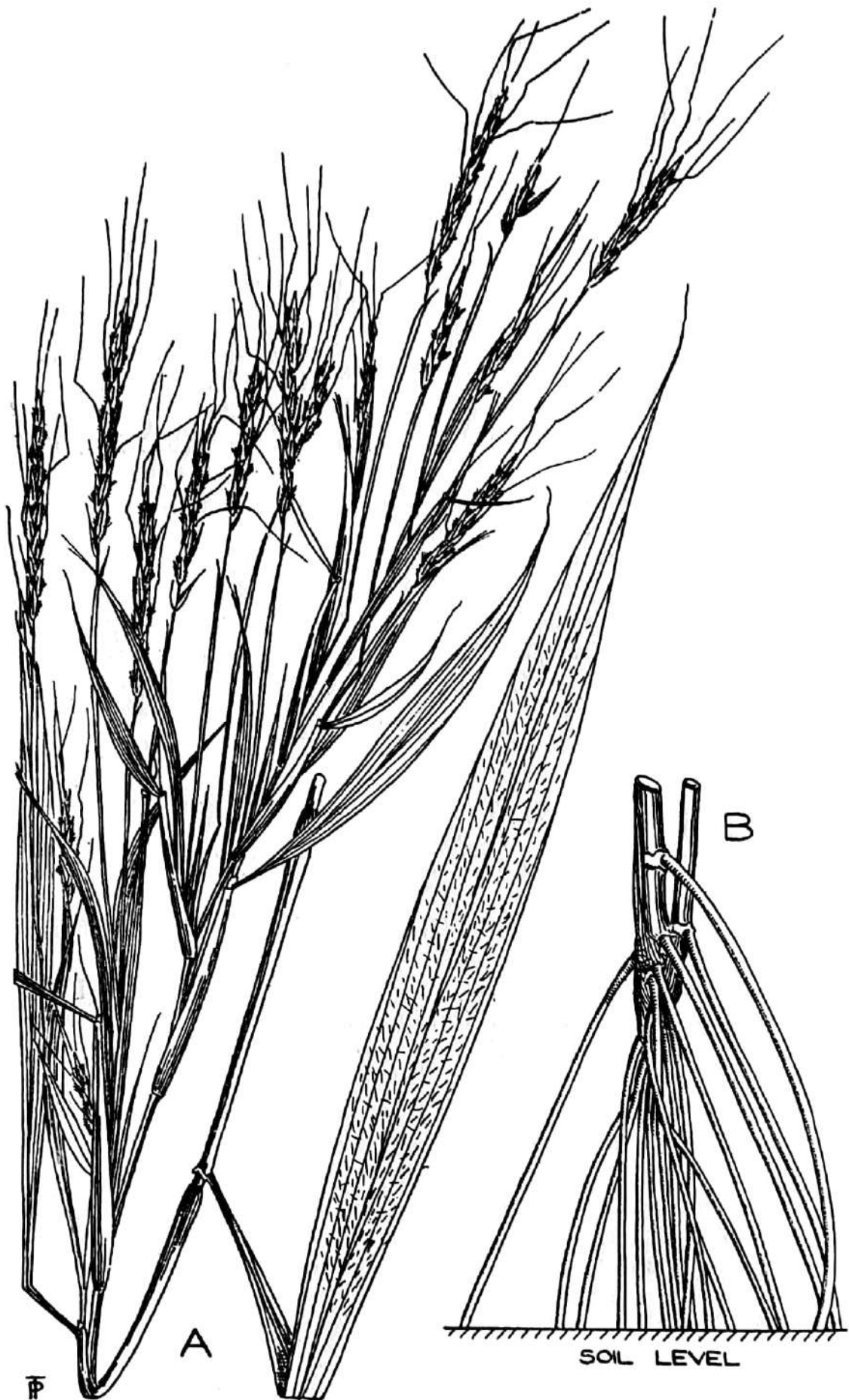


Fig. 28. *Triplopogon ramosissimus* (Hack.) Bor
 A, top portion of the plant $\times \frac{1}{2}$; B, basal portion, showing stilt roots $\times \frac{1}{2}$.

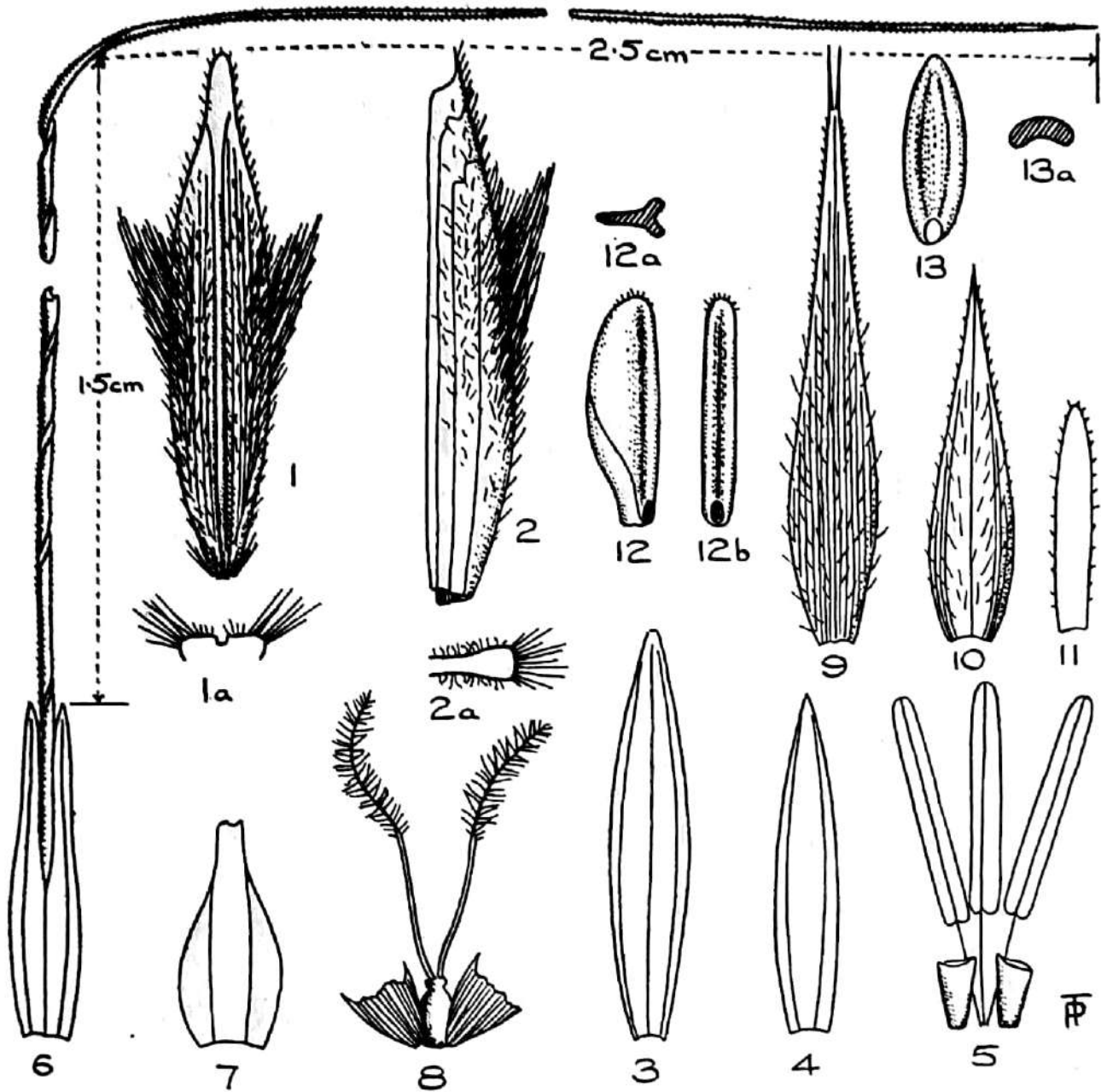


Fig. 29. *Triplopogon ramosissimus* (Hack.) Bor

Details of the spikelet structure. 1, lower glume of sessile spikelet; 1a, transverse section of 1; 2, upper glume; 2a, transverse section of 2; 3, lower lemma; 4, palea; 5, stamens and lodicules of lower floret; 6, upper lemma and awn; 7, palea; 8, gynoeceum and lodicules; 9, lower glume of pedicelled spikelet; 10, upper glume; 11, lemma; 12, caryopsis; 12a, transverse section of 12; 12b, adaxial face of caryopsis showing groove and hilum; 13, caryopsis of *Sehima ischaemoides* Forssk.; 13a, transverse section of 13; all $\times 7$.

- Vetiveria* Lem.-Lisanc. in Bull. Soc. Philom. 1822, 43 (1822).
Mandelorna Steud., Syn. Pl. Glum. 1, 359 (1854).
Anatherum P. Beauv., Essai Agrost. 128 (1812) pro parte.

Key to the species of *Vetiveria*

1. Lower glume muriculate; panicle 15–40 cm long; joints and pedicels glabrous; callus of sessile spikelets glabrous *V. zizanioides*
1. Lower glume with a row of marginal tubercles which get bigger upwards, becoming spinulose; joints and pedicels with a basal tuft of hairs; callus of sessile spikelets bearded *V. lawsonii*

- ✓ 1. *Vetiveria lawsonii* (Hook. f.) Blatt. et McCann in J. Bombay Nat. Hist. Soc. 32, 409 (1928).

Andropogon lawsonii Hook. f., Fl. Brit. Ind. 7, 187 (1896).

Distribution: Bombay and Madras States. Blatter says this species is very abundant and is the main constituent of pastures in the Mallad tract of the Carnatic.

Exsicc.—Meebold 10768, Mysore; J. Fernandez 423, North Kanara.

- ✓ 2. *Vetiveria zizanioides* (Linn.) Nash in Small, Fl. South-east U.S. 67 (1903).

Phalaris zizanioides Linn., Mant. Pl. 2, 183 (1771).

Andropogon muricatus Retz., Obs. Bot. 3, 43 (1783).

Agrostis verticillata Lamk., Encycl. Meth. Bot. 1, 59 (1783) non Vill. (1779).

Anatherum muricatum (Retz.) P. Beauv., Ess. Agrost. 150 (1812) t. 22, f. 10.

Vetiveria odoratissima Lem.-Lisanc. in Bull. Soc. Philom. (Paris) 43 (1822).

V. odorata Virey, J. Pharm. 13, 501 (1827).

V. muricata (Retz.) Griseb., Fl. Brit. West Ind. 560 (1864).

V. arundinacea Griseb., loc. cit. 559.

Sorghum zizanioides (Linn.) O. Ktze., Rev. Gen. Pl. 2, 791 (1891).

Andropogon zizanioides (Linn.) Urban, Symb. Antill. 4, 79 (1903).

Holcus zizanioides (Linn.) O. Ktze. ex Stuck. in Ann. Mus. Nac. Buenos Aires 11, 48 (1904).

Anatherum zizanioides (Linn.) Hitchc. et Chase in U.S. Natl. Herb. Contrib. 18, 285 (1917).

Andropogon festucoides J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 340 (1830).

Distribution: India, Burma, Ceylon, South-east Asia to Tropical Africa.

The name under which this species appears in the *Flora of British India* is *Andropogon squarrosus* Linn. f., a name which was published in the *Supplementum Plantarum* 433 (1781). Hook. f. presumably followed

Hackel in this matter and quotes the earlier *Phalaris zizanioides* Linn. in his synonymy, again following Hackel, who remarks in brackets after the name *Phalaris zizanioides* (ex descr. herbarioque Linnaeano). It is certain that neither Hackel nor Hook. f. saw the Linnean sheet of *Andropogon squarrosus* or they would never have made this error, for the plant on the Linnean sheet is not *Vetiveria zizanioides*, nor does the description in the *Supplementum* fit the plant on the sheet, which in fact is *Pseudoraphis spinescens* (R.Br.) Vickery.

Actually the sheet of this species in the Linnean Herbarium is named *Andropogon scabrum* by Linn. f. with the "scabrum" crossed out in pencil and the specific name "*squarrosus*" added, also in pencil, with the pencilled initials "J.E.S.", i.e. J. E. Smith. König, who collected this plant, wrote a short diagnosis on a label which is affixed to the sheet with a pin. Most of this diagnosis is quoted by Linn. f. in the description of *Andropogon squarrosus* published in the *Supplementum*, but he added other details which are not to be found in the plant. Linn. f. talks about hermaphrodite sessile spikelets and pedicelled male spikelets (indicating *Andropogoneae*), whereas the specimen has only sessile hermaphrodite spikelets. He also mentions glabrous culms, whereas the specimens have bearded nodes. It is better, therefore, to reject altogether the name *Andropogon squarrosus* Linn. f. as a *nomen confusum*.

It may be worth mentioning that in the herbarium of J. Gay (a very careful worker) preserved at Kew, *Andropogon squarrosus* is reduced to the synonymy of *Phalaris zizanioides* "teste Kunth qui ab auct. miss. in herb. Vent. vidit". This specimen has not been found in Ventenat's herbarium but the detailed mention of it by J. Gay seems to warrant the rejection of the name.

Exsicc.—J. S. Gamble 11233 Madras; H. H. Haines 2864, Dehra Dun; F. Ballard 1491, Ceylon; U Thein Lwin 125, Burma. $2n = 20$.

Vossia Wall. et Griff. in J. Asiat. Soc. Bengal 5, 572 (1836) t. 23; nomen genericum conservandum non Adans. (1763) nec Thüm. (1879).

1. **Vossia cuspidata** (Roxb.) Griff., Not. 3, Index p. 12 (1851).
Ischaemum cuspidatum Roxb., Fl. Ind. 1, 325 (1820).
Vossia procera Wall. et Griff. in J. Asiat. Soc. Beng. 5, 573 (1836).
 Distribution: In swamps and bheels in Assam, Bengal and Burma, extending to Tropical Africa.
 This, although a robust leafy species, is not found in sufficient quantities to be of any account as a fodder. Buffaloes will eat it at any stage. It usually grows in water up to 1 m deep at the margins of bheels. It is, however, sometimes a floating grass and then develops large numbers of roots and rootlets from the nodes of the spongy stem.
 Exsicc.—Griffith 6822, Bengal, 1103, Assam; Keenan s.n., Cachar.



Fig. 30. *Vossia cuspidata* (Roxb.) Griff.
 1, base of plant and inflorescence $\times \frac{1}{2}$; 2, ligule $\times 1$; 3, sessile and pedicelled spikelets $\times 2$; 4, lower glume $\times 4$; 5, upper glume $\times 4$.

PANICOIDEAE—MAYDEAE**MAYDEAE** Dumort., Obs. Gram. Belg. 84, 142 (1823)

Spikelets unisexual, dissimilar, monoecious in the same inflorescence or in different inflorescences, when in the same inflorescence the male spikelets above the female. Male spikelets 2-flowered, mostly paired, one sessile, one pedicelled or both pedicelled; glumes enclosing the florets, chartaceous or membranous; lemmas hyaline; paleas if present similar; stamens 3; anthers linear; lodicules 2, fleshy. Female spikelets 2-flowered, with the lower floret barren, solitary or sometimes paired, sunk in the cavities of a thickened jointed rhachis, crowded in rows on a thick spongy rhachis, or solitary, enclosed in a bony, hardened, false involucre derived from a metamorphosed sheath. Glumes firm or thin, emarginate or lobed; lemmas membranous, short, unawned; paleas somewhat similar or the lower absent; lodicules 2 or 0. Grain subglobose or flattened, enclosed in the hardened false involucre or metamorphosed sheath or surrounded by the indurated glumes or enclosed between the hardened lower glume and the adjacent joint of the rhachis; hilum basal, ovate, linear or punctiform; starch grains simple.

Annual or perennial herbs. Leaf-blades linear to lanceolate, with panicoid anatomy; silica-cells cross- or dumb-bell-shaped; hairs 2-celled, slender, elongate. Ligules well developed.

Chromosomes small; basic number 5, 9 (10).

Genera: Chionachne

Coix

Euchlaena

x *Euchlaezea*

Polytoca

Trilobachne

Tripsacum

Zea

Key to the genera and intergeneric hybrid of **Maydeae**

1. Female spikelets completely enclosed in a metamorphosed leaf-sheath which takes the form of a spherical or cylindrical, osseous or ivory bead-like structure **Coix**
1. Female spikelet not enclosed in a false involucre as above:—
 2. Female spikelets in crowded longitudinal rows on a very thick axis; male spikelets in ample terminal panicles **Zea**
 2. Inflorescence, especially the female, not as above:—
 3. Female spikelets not enclosed partly or wholly in a hardened lower glume, usually sunk in the slotted axis joint:—
 4. Female spikelets solitary at each node **Euchlaena**

4. Female spikelets in pairs at each node **x Euchiæzeæ**
3. Female spikelets enclosed in a structure partly derived from the hardened lower glume and partly from the thickened axis-joint or internode:—
5. The fruit-case is formed partly by the lower glume and chiefly by the broad thickened internode or joint of the rhachis; male and female spikelets in the same spike, the male terminal; sheath not tessellately nerved **Tripsacum**
5. The fruit-case is chiefly formed by the lower glume and in a lesser degree by the narrow joint or internode of the rhachis; spikes monoecious:—
6. Lower glume of the female spikelet 3-lobed, the central lobe larger than the others **Trilobachne**
6. Lower glume of the female spikelet not 3-lobed, at most with 2 or 3 small teeth:—
7. Base of the grain hollowed out; hilum situated at the bottom of this cavity and thus invisible from the side or from in front **Polytoca**
7. Base of the grain not hollowed out and hilum quite visible on the surface of the grain:—
8. Male spikelets solitary at the tip of an inflorescence; lower glume of ♀ spikelet with a membranous appendage, wavy on the back **Sclerachne**
8. Male spikelets several at the tip of an inflorescence; lower glume of ♀ spikelets without a membranous appendage, not wavy **Chionachne**

Chionachne R.Br. in Benn., Pl. Jav. Rar. 15 (1838).

Key to the species of *Chionachne*

1. Fruit-case solitary, dead-white, shining, smooth and glabrous, compressed, oblong, rounded above, not furnished with membranous wings
1. Fruit-cases several, jointed together, cylindrical, yellowish to yellowish-brown, furnished on the margins above with membranous wings which clasp the base of the fruit next above *Ch. koenigii*
- ✓ 1. **Chionachne koenigii** (Spreng.) Thw., Enum. Pl. Zeyl. 357 (1864).
Coix koenigii Spreng., Syst. 1, 239 (1825).
C. barbata Roxb., Fl. Ind. 3, 569 (1832).
C. arundinacea Koen. ex Willd., Sp. Pl. 4, 203 (1805) non Lamk. (1791).
Chionachne barbata (Roxb.) R.Br. in Benn., Pl. Jav. Rar. 18 (1838).
Coix crypsoides C. Muell. in Bot. Zeit. 19, 334 (1861).
Polytoca barbata (Roxb.) Stapf in Hook. f., Fl. Brit. Ind. 7, 102 (1896).

Distribution: Widely distributed in India, Ceylon and Burma, but apparently absent in the dry north-western parts.

This is one of the stilt-rooted species found in shade in wettish places, often sporadic in jungle clearings. The sheaths and leaves are covered with irritating hairs, making it a plant to be avoided. Grazing animals do not like it for obvious reasons. The margins of the leaves are razor-sharp. Exsicc.—Hook. f. et T. Thoms. 2356, Khasi Hills; J. R. Drummond 21063, Panjab. $2n = 20$.

✓ 2. *Chionachne semiteres* (Benth.) Henr. in Meded. Rijks Herb. n. 67, 16 (1931).

Tripsacum semiteres Wall., Cat. Herb. Ind. n. 8628 nomen nudum.

Polytoca semiteres Benth. in Benth. et Hook. f., Gen. Pl. 3 (1883) 1113 nomen nudum. Description in Hook. f., Fl. Brit. Ind. 7, 101 (1896).

Chionachne wightii Munro in Benth. et Hook. f., Gen. Pl. 3, 1113 (1883) nomen.

Distribution: Madras State, Burma.

Exsicc.—Herb. Wight. 3318, Madras; Wallich 8628, Burma. $2n = 20$.

Coix Linn., Gen. Pl. ed. 5, 419 (1754) et in Sp. Pl. ed. 1, 972 (1753).

Lithagrostis Gaertn., Fruct. 1, 7 (1789), t. 1.

Lacryma Medic., Phil. Bot. 1, 177 (1789).

Key to the species and varieties of *Coix*

1. Lower glume of the male spikelets narrowly or hardly winged (spikelets 2–3 mm wide):—
 2. Involucres* ovoid, cylindrical or bottle-shaped, if globose over 4 mm in diameter:—
 3. Involucres ovoid:—
 - 3a. Involucre hard, polished *C. lacryma-jobi* var. *lacryma-jobi*
 - 3a. Involucre soft, shell-like, striate *C. lacryma-jobi* var. *ma-yuen*
 3. Involucres not ovoid, hard, smooth, polished, not striate:—
 4. Involucres very much longer than broad, cylindrical or roughly bottle-shaped; annual *C. lacryma-jobi* var. *stenocarpa*
 4. Involucres 7–10 mm in diameter often globose, flattened on one side; annual *C. lacryma-jobi* var. *monilifer*
 2. Involucres globose, 4 mm in diameter, white or bluish, very hard; perennial *C. puellarum*
1. Lower glume of the male spikelets broadly winged (spikelets 5–6 mm broad); perennials:—
 5. Floating and creeping plants with succulent stems and floating roots at the nodes; upper surface of the leaves densely covered with

*A name given here to the cylindrical or bead-like structure formed from a metamorphosed leaf-sheath.

conspicuous glands which bear bristle-like hairs; ripe involucre abruptly constricted at the neck into a beak *C. aquatica*†

5. Erect plants; upper surface of the leaves without numerous conspicuous glands; involucre not abruptly constricted at the neck into a beak *C. gigantea*†

✓ 1. ***Coix aquatica* Roxb.**, Fl. Ind. ed. 2, 3, 571 (1832).

Distribution: Southeast Asia.

This species has since Roxburgh's time been considered to be a variety of *C. gigantea* Roxb., and they are certainly very difficult to separate in the herbarium, but since the habit of each is different and each has a different chromosome number, I have decided that *Coix aquatica* Roxb. is worthy of specific rank. This is a floating or creeping plant and the stems can reach a length of over 30 m. Where it grows gregariously it provides rich feeding for buffaloes. An interesting abnormality on one of the Kew sheets (*Stocks*, Malabar) is that one of the involucre (metamorphosed leaf-sheaths) has developed a perfect leaf-blade from its tip. $2n = 10$ (Janaki Ammal).

Exsicc.—J. F. Duthie 8493, Madhya Pradesh; *Stocks* s.n., Concan.

✓ 2. ***Coix gigantea* Koenig ex Roxb.**, Hort. Beng. 66 (1814) nomen, et in Fl. Ind. ed. 2, 3, 570 (1832) descr.

C. lingulata Hack. in Öst. Bot. Z. 41, 5 (1891).

Distribution: Southeast Asia.

This species is usually found in hot valleys but will invade moist areas such as paddy fields where it can become such a menace as to render the fields unfit for the cultivation of paddy. It will, on the other hand, grow on dry soil where it can be profitably harvested for food. It differs from *C. aquatica* in habit, and a number of ill-defined characters. It should not be difficult to devise experiments to show whether *C. aquatica* is really distinct or if it is only a habitat form. $2n = 20, 40$.

Exsicc.—Wallich 8624 (c), Madras; Collett 51, Burma; Herb. Rottl., Ceylon.

✓ 3. ***Coix lacryma-jobi* Linn.**, Sp. Pl. ed. 1, 972 (1753).

C. lacryma Linn., Syst. Nat. ed. 10, 1261 (1759).

C. agrestis Lour., Fl. Cochinch. 551 (1790).

C. arundinacea Lamk., Encycl. Meth. Bot. 3, 422 (1791).

C. exaltata Jacq., Eclog. Gram. 60 (1820) t. 40.

C. ovata Stokes, Bot. Mat. Med. 4, 343 (1812).

C. pendula Salisb., Prodr. 28 (1796).

Lithagrostis lacryma-jobi Gaertn., Fruct. 1, 7 (1789) t. 1, f. 10.

A tall grass which is cultivated in many parts of the tropics, particularly among the hill tribes who make a porridge and also brew a beer from it. The soft-shelled races are cultivated for these purposes but the hill tribes also cultivate several hard-shelled varieties which are used for ornament.

† The only really reliable feature for separating these two is the habit.

The involucre or metamorphosed leaf-sheath is white, various shades of blue or even brown, and the hill tribes have names for a very large number of races. The leaves and stem provide a useful fodder.

var. **lacryma-jobi**.

Distribution: Native in tropical Asia but now widely distributed in the tropics.

Exsicc.—*J. F. Duthie* 6742, Mt. Abu; *J. S. Gamble* 7338, Sikkim; *C. A. Barber* 4851, Madras.

var. **ma-yuen** (*Romanet*) *Stapf* in *Hook. f., Fl. Brit. Ind.* 7, 100 (1896).

Coix ma-yuen *Romanet* in *Bull. Soc. Acclim. Paris, sér. 3*, 8, 442 (1881).

Distribution: Southeast Asia.

Exsicc.—*Hook. f. and T. Thoms.* s.n. Khasia; *Abdul Khalib* s.n. Burma.

This variety is commonly cultivated by the hill-tribes of Assam and Burma, who make a porridge and also brew a beer from the soft-shelled fruits. The stem and leaves provide a useful fodder.

var. **monilifer** *Watt* in *Agric. Ledger*, 214 (1904) descr.; in *Dict. Econ. Prod.* 493 (1887) nomen.

Distribution: Burma.

This name was given by Watt to a wild variety in which the large stony involucre are flattened on one face.

Exsicc.—*Griffith* s.n., Malacca; *Badal Khan* 271, Burma.

var. **stenocarpa** *Stapf* in *Hook., Icones Pl. sub tab.* 1764 (1888).

C. stenocarpa *Balansa* in *Morot, J. de Bot.* 4, 77 (1890).

C. tubulosa *Hack. ex Warbg.* in *Engl., Bot. Jahrb.* 13, 260 (1890).

Distribution: South-east Asia.

The Nagas use the hard tubular bony involucre to ornament their dancing equipment. The plant grows wild near Naga villages.

Exsicc.—*Griffith* 6450, Mergui; *G. Watt*, Naga Hills. $2n = 20$.

4. **Coix puellarum** *Balansa* in *Morot, J. de Bot.* 4, 77 (1890).

Coix lacryma-jobi *Linn. var. puellarum* (*Balansa*) *A. Camus* in *Lecomte, Fl. Gén. de l'Indo-Chine* 7, 220 (1922).

Distribution: Burma, Malaysia and Indo-China.

This perennial has small globose fruits. It has not been often collected but is apparently common in parts of South-east Asia.

Exsicc.—*Wallich* 8623, Burma; *Parry* 496, Lushai.

Euchlaena *Schrad.*, in *Linnaea* 8 (1833) *Litt.-Bericht*, 25.

Reana *Brign.* in *Ann. Sci. Nat. sér. 3*, 12, 365 (1849).

1. **Euchlaena mexicana** *Schrad.*, *Ind. Sem. Hort. Goettingen* (1832); reprinted in *Linnaea* 8, *Litt.-Bericht*, 25 (1833).

Reana luxurians *Dur.* in *Bull. Soc. Acclim.* 9, 581 (1872) nomen.

Euchlaena luxurians *Dur. et Aschers.* in *Bull. Soc. Linn. Paris*, 1, 107 (1877).

Euchlaena mexicana var. *luxurians* Haines, Bot. Bihar and Orissa 1065 (1924).

Zea mexicana Reeves et Mangelsd. in Amer. J. Bot. 29, 817 (1942).

Distribution: Mexico, but cultivated for fodder in many parts of the world.

Cultivated in Uttar Pradesh and in other parts of India for fodder. Horses are said to be very fond of it.

A warm climate, moderate rainfall and a good loamy soil are prerequisites for the production of a good crop of this grass, and it is said to fail where these conditions are not present. Grown as a crop in favourable places, the yields are very heavy. $2n = 20$.

x *Euchlaezea janaki* gen. hybr. ined.

1. x *Euchlaezea mertonensis* Janaki ined.

A perennial grass. *Culms* erect from the base, up to 2 m or more tall, terete or somewhat compressed, rooting at the lower nodes and often erect upon the stilt-roots which are numerous from the lower nodes. *Leaf-blades* up to 60 cm long by 4 cm broad, linear-acuminate, bright green above, rather dull below, abruptly contracted at the base to the sheath, smooth and glabrous below, scaberulous on the upper surface and on the margins, rather flaccid; *sheaths* in the lower half tightly clasping, much swollen at the base at the node, markedly striate, with anastomosing veins, very loose at the upper nodes where the female inflorescences are found; *ligule* a lacerate membrane 2–3 mm long.

Inflorescence of female or male elements or a mixture of both. The terminal inflorescences either male or male racemes above the female, the lateral usually female on short side shoots with short internodes. The female spike is unique in the tribe in having two spikelets seated side by side at each node.

Female inflorescence a spike, 6–7 cm long, consisting of a zig-zag fragile rhachis upon which are seated alternately the globular female spikelets; articulations very oblique, at 45° to the axis; joints obliquely truncate-cuneate, the upper articulation being at 90° to the lower, deeply hollowed out, carrying one or usually two female spikelets in the recess, 8 mm long on the abaxial surface, 3 mm on the adaxial. *Lower glume* oblong, apiculate, becoming coriaceous, 7 mm long, with very broad hyaline margins clasping the upper glume; *upper glume* closely fitted to the deep recess, rather thick but delicate in texture with very broad flaps wrapped round the florets. *Lower floret* empty; *lemma* triangular in shape with broad flaps; *palea* of same texture but narrower. *Upper floret* ♀; *lemma* hyaline, triangular with broad flaps; *palea* of same texture; *style* 1; *stigmata* extremely long, over 20 cm long, hanging in tassels from the bracts supporting the ♀ inflorescence.

The male inflorescence consists of a number of (about 5) racemes

(10–12 cm long) seated at the tip of a terminal peduncle; rhachis of the racemes tough, convex on the abaxial surface, concave on the adaxial, scabrid on the margins, glabrous. *Spikelets* two at each node, a sessile and a pedicelled. *Sessile spikelet* ♂; *lower glume* 8 mm long, elliptic-acute, 2-keeled, flat on the dorsal surface, 4-nerved between the keels, scabrid and narrowly winged on the keels; lateral flaps broad, hyaline; *upper glume* lanceolate-acute 8 mm long, 2-keeled, 3-nerved. *Lower floret* ♂; *lemma* hyaline, lanceolate-acute, 2-nerved; *palea* narrower; *stamens* 3; *anthers* 4.5 mm long. *Upper floret* ♂; *lemma*, *palea* and *stamens* as in the lower floret, or *stamens* absent. *Pedicelled spikelet* similar to the lower.

This intergeneric hybrid (*Euchlaena perennis* ♀ x *Zea mays* ♂) was raised by Dr. E. K. Janaki Ammal, while working at the John Innes Horticultural Institution, then situated at Merton. It is mentioned here as plants have been sent to India and it may possibly be cultivated for fodder. A description is provided to help the agrostologist who may be confronted with it. It should not be forgotten, also, that hybrids may arise spontaneously when the two genera are grown in adjoining fields or in areas close together.

Polytoca R.Br. in Benn., Pl. Jav. Rar. 20 (1838) t. 5.

Cyathorhachis Nees ex Steud., Syn. Pl. Glum. 1, 403 (1855).

Key to the species of *Polytoca*

1. Male spikelets 5–6 mm long, acute or acuminate; the lower glume with two hyaline appendages at the base, ending in a long deciduous awn; fruit-case about 7 mm long, 2.5 mm broad *P. wallichiana*
1. Male spikelets 9–10 mm long, acute; lower glume not awned and without appendages; fruit-case about 1 cm long, 3 mm broad *P. digitata*

1. ***Polytoca digitata*** (Linn. f.) Druce in Rep. Bot. Exch. Club, Brit. Isles 4, 641 (1916); (Linn. f.) Henr. in Meded. Rijks Herb. Leid. no. 67, 10 (1931).

Apluda digitata Linn. f., Suppl. Pl. 434 (1781).

Polytoca bracteata R.Br. in Benn., Pl. Rar. Jav. 20 (1838) t. 5.

Coix heteroclita Roxb., Fl. Ind. ed. 2, 3, 572 (1832).

Polytoca heteroclita (Roxb.) Koord., Exkursionsfl. Java. 1, 99 (1911), in clavi et Merrill in Philipp. J. Sci. Bot. 10, 288 (1915).

Distribution: Eastern India, Burma, Malaya, Siam.

Exsicc.—Griffith 324; H. H. Haines 566, Duars; F. Kingdon-Ward 22626, Burma.

2. ***Polytoca wallichiana*** (Nees) Benth. in J. Linn. Soc. (Bot.) 19, 52 (1881).

Cyathorhachis wallichiana Nees ex Steud., Syn. Pl. Glum. 1, 403 (1855).

Distribution: Sikkim (teste Henr.), Assam, Pegu.

Exsicc.—Parkinson 4280, Chittagong; U Thein Lwin 239, Burma.

Sclerachne *R.Br.* in Benn., Pl. Jav. Rar. 15 (1838) t. 4.

1. **Sclerachne punctata** *R.Br.* in Benn., Pl. Rar. Jav. 15 (1838), t. 4.
Polytoca punctata Stapf ex Hook. f., Fl. Brit. Ind. 7, 102 (1896).
Chionachne massii Balansa in Morot, J. de Bot. 4, 78 (1890).

In the *Flora of British India*, Rottler is quoted as the authority for this plant, said to have been collected in Madras, but I have not seen the sheet, nor does Fischer mention this plant in the *Flora of Madras*. It is common in Malaya and other parts of South-east Asia and is to be expected in Burma. Its presence in Madras should not be ruled out. $2n = 20$.

Trilobachne *Schenck ex Henr.* in Meded. Rijks

Herb. Leid. n. 67, 4 (1931).

- ✓ 1. **Trilobachne cookei** (*Stapf*) *Schenck ex Henrard* in Meded. Rijks Herb. Leid. n. 67, 4 (1931).

Polytoca cookei Stapf in Hook., Ic. Pl. (1894), t. 2333.

Distribution: Bombay, Kanara, Concan.

Exsicc.—*Lisboa* s.n., Concan; *Stocks* s.n., Concan.

Tripsacum *Linn.*, Syst. Nat. ed. 10, 2, 1261 (1759).Key to the species of *Tripsacum*

1. Inflorescence very lax; male racemes slender, flexuous; male spikelets 4 mm long; leaves 5–9 cm wide *T. laxum*
1. Inflorescence stiff; male racemes straight or curved but not flexuous; male spikelets 7–8 mm long; leaves up to 2 cm wide *T. dactyloides*
1. **Tripsacum dactyloides** (*Linn.*) *Linn.*, Syst. Nat. ed. 10, 2, 1261 (1759).

Coix dactyloides *Linn.*, Sp. Pl. ed. 1, 972 (1753).

Coix angulata *Mill.*, Gard. Dict. ed. 8 (1768). *Coix* no. 2.

Ischaemum glabrum *Walt.*, Fl. Carol. 249 (1788).

Tripsacum monostachyum *Willd.*, Sp. Pl. 4, 202 (1805).

Dactylodes angulatum *O. Ktze.*, Rev. Gen. Pl. 2, 773 (1891).

Distribution: Southern States of the U.S.A.

Introduced into India—it is an excellent fodder. $2n = 36, 72$.

2. **Tripsacum laxum** *Nash* in N. Am. Fl. 17, 81 (1909).

Distribution: Mexico, South America.

Introduced into Ceylon from the Philippines in 1926 (*Senaratna*, 1956) and cultivated for fodder. According to *Senaratna* it is much used as a soil binder on up-country tea estates.

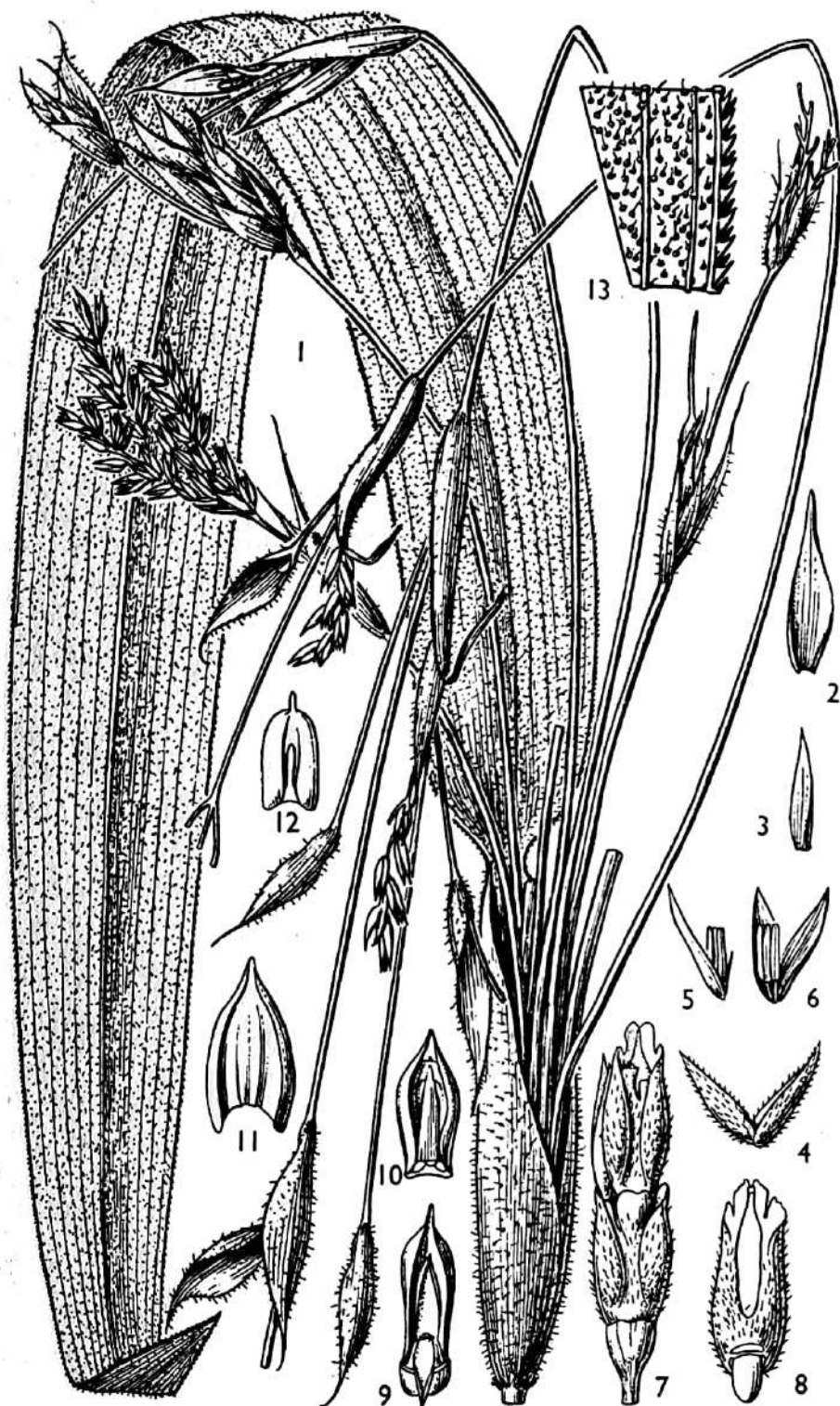


Fig. 31. *Trilobachne cookei* (Stapf) Schenck
 1, plant $\times \frac{1}{2}$; 2 and 3, lower and upper glumes of neuter spikelets of female inflorescence; 4, glumes of male spikelet; 5 and 6, lower and upper floret of the same $\times 2$; 7, part of female raceme; 8, female spikelet from back, lower glume encircling the upper; 9, upper glume, lower lemma and palea of same; 10, upper lemma and palea and ovary; 11, upper glume of ♀ spikelet; 12, caryopsis, all $\times 4$; 13, portion of leaf surface and margin showing tubercled based hairs and serrate margin (enlarged).

Zea Linn., Gen. Pl. ed. 5, 419 (1754) et in Sp. Pl. ed. 1, 971 (1753).

Mays Tourn. ex Gaertn. Fruct. 1, 6 (1789), t. 1.

- ✓ 1. *Zea mays* Linn., Sp. Pl. ed. 1, 971 (1753).
Mays zea Gaertn., Fruct. 1, 6 (1789), t. 1.
Zea segetalis Salisb., Prodr. Stirp. 28 (1796).
Mays americana Baumg., Enum. Stirp. Transsilv. 3, 281 (1816).
Mayzea cerealis Raf., Med. Fl. 2, 241 (1830).
Zea hirta Bonaf., Hist. Nat. Mais 29 (1836), t. 4.
Zea erythrolepis Bonaf., Hist. Nat. Mais 30 (1836), t. 5.
Z. saccharata Sturtev., N.Y. State Agr. Expt. St. Rpt. 156 (1885).

Distribution: A native of America but now cultivated in all warm countries.

Widely cultivated in India where it is found in many races. The corn is eaten and the foliaceous bracts in which the inflorescences are concealed are used as a wrapping for cigarettes in India, and cheroots in Burma. The stems and leaves can be fed to cattle and are regularly used for this purpose by the hill tribes of Assam.

The male spikelets are usually collected in terminal racemes, while the solitary female inflorescence consists of numerous female spikelets seated on a spongy axis. Abnormalities do occur; for example, the female inflorescence may consist of several of the ordinary inflorescences on an axis, and sometimes the axis may be produced to carry male spikelets [see Parandekar in *J. Bombay Nat. Hist. Soc.* 49, 573 (1950)]. Chromosome number $2n = 20+1-7B$; 10, 30, 40, 80.

PANICOIDEAE—PANICEAE

PANICEAE *R. Brown* in Flinders, Voy. Terra Australis 2, 582 (1814)

Spikelets usually similar, hermaphrodite, rarely unisexual, solitary or paired, usually deciduous from the pedicels at maturity, 2-flowered, with the lower floret male or barren, and the upper hermaphrodite. Glumes membranous or herbaceous usually unequal, the lower rarely reduced to a mere thickened rim or absent altogether, rarely both absent; lower lemma of similar texture to the glumes, paleate or not; upper lemma of firmer texture than the lower, smooth or rarely rugose; palea of the same texture as the lemma; lemma awnless or with a very short stout awn from the tip; rhachilla not or very rarely produced. Lodicules usually 2. Stamens 3. Ovary glabrous; styles 2, stigmas plumose. Caryopsis firmly enclosed by the lemma and palea; hilum usually basal, punctiform; embryo half the length of the grain; starch grains simple.

Annual or perennial herbs, rarely woody. Leaf-blades linear to lanceolate, rarely ovate, tapering or rounded at the base, rarely cordate, usually flat, with panicoid anatomy; silica-cells nodular, dumb-bell- or cross-shaped; micro-hairs 2-celled, filiform; others club-shaped in some spp. of *Digitaria*. First foliage leaf of the seedling flat and horizontal. Spikelets arranged in effuse or contracted panicles or in a spike-like inflorescence and then frequently surrounded by reduced bristle-like branches. Ligule membranous, a row of hairs or rarely absent.

Chromosomes small; basic numbers 9, 10, rarely 7, 15, 17, 19.

<i>Genera:</i> <i>Acroceras</i>	<i>Panicum</i>
<i>Alloteropsis</i>	<i>Paspalidium</i>
<i>Axonopus</i>	<i>Paspalum</i>
<i>Brachiaria</i>	<i>Pennisetum</i>
<i>Cenchrus</i>	<i>Pseudechinolaena</i>
<i>Cyrtococcum</i>	<i>Pseudoraphis</i>
<i>Digitaria</i>	<i>Rhynchelytrum</i>
<i>Echinochloa</i>	<i>Sacciolepis</i>
<i>Eriochloa</i>	<i>Setaria</i>
<i>Holcolemma</i>	<i>Spinifex</i>
<i>Hymenachne</i>	<i>Stenotaphrum</i>
<i>Ichnanthus</i>	<i>Thuarea</i>
<i>Melinis</i>	<i>Trachys</i>
<i>Oplismenus</i>	<i>Tricholaena</i>
<i>Ottochloa</i>	<i>Urochloa</i>

Key to the genera of **Paniceae**

1. Inflorescence in panicles, heads or racemes—if the latter then the rhachis of the raceme not jointed and disarticulating and the spikelets

not in groups, surrounded by empty glumes, on the undersurface of each raceme-joint:—

2. Spikelets mostly unisexual, occasionally some hermaphrodite (*Thuarea*):—

3. Spikelets dioecious; the female solitary on axes collected into a spherical head; the male seated on a sharp-pointed rhachis, many of which are collected together terminating the culm and branches or in the axils of leaves **Spinifex**

3. Spikelets monoecious; the upper 4–6 male, deciduous; the lower 1–2 hermaphrodite or female, persistent **Thuarea**

2. Spikelets all similar in shape and sex:—

4. Spikelets finely awned or mucronate from the notched tips of the upper glume and lower lemma, delicately pedicelled, panicle; lower glume minute; upper lemma rigidly membranous:—

5. Upper glume markedly gibbous, 5-nerved; lower glume separated from the upper by a space over 0.6 mm long

Rhynchelytrum

5. Upper glume not gibbous, 5–7-nerved:—

6. Upper glume 7-nerved; lower lemma 5-nerved; spikelets awned, not compressed laterally **Melinis**

6. Upper glume and lower lemma 5-nerved; spikelets unawned, laterally compressed **Tricholaena**

4. Spikelets not awned or if awned then sessile in false secund variously arranged spikes and with awns from the entire tips of the upper glumes and lower lemmas (*Echinochloa* spp.) or from the tips of both glumes (*Oplismenus*); upper lemma mostly crustaceous, rarely chartaceous:—

7. Spikelets falling singly, not subtended by bristles, or if so, then the bristles persisting after the spikelets have fallen (*Setaria*):—

8. Spikelets arranged in more or less open panicles, or with the panicles contracted and spike-like:—

9. Spikelets not subtended by bristle-like branches:—

10. Spikelets arranged in open or contracted panicles:—

11. Spikelets not or only slightly gibbous:—

12. Fertile floret without lateral basal appendages or scars:—

13. Upper glume as long as the spikelet **Panicum**

13. Upper glume much shorter than the spikelet

Ottochloa

12. Fertile floret with lateral basal appendages or scars

Ichnanthus

11. Spikelets distinctly gibbous and laterally much compressed

Cyrtococcum

10. Spikelets usually arranged in cylindrical spike-like panicles; upper glume inflated or not:—

14. Upper lemma and palea indurated and closed at apex; upper glume inflated; spikelets more or less gibbous
Sacciolepis
14. Upper lemma and palea membranous, gaping at apex; spikelets lanceolate
Hymenachne
9. Spikelets subtended—or replaced by one to many bristle-like branchlets which remain after the spikelets have fallen:—
 15. Lower lemma with a deep furrow in the back; spikelets somewhat saccate at the base, of the lower clusters supported or replaced by bristles, of the upper clusters bare
Holcolemma
 15. Lower lemma without a furrow; spikelets often turgid, always supported by bristles; upper lemma often transversely rugose
Setaria
8. Spikelets arranged in one-sided spikes or spike-like racemes; spikes or racemes digitate or scattered, rarely solitary:—
 16. Lemma of the upper floret more or less crustaceous or coriaceous, usually with narrow inrolled margins, exposing much of the palea:—
 17. Spikelets dorsally compressed or almost terete, the glumes and lower lemma rounded on the back or only keeled at the tip:—
 18. Lower glume and lowest internode of the rhachilla not forming a swollen callus at the base of the spikelet:—
 19. Glumes and lemmas with laterally compressed and thickened apices
Acroceras
 19. Glumes and lemmas not as above:—
 20. Lower glume (when present) turned away from the rhachis of the racemes or spike, the back of the upper lemma facing it, i.e. spikelets abaxial:—
 21. Lower glume developed, although sometimes small:—
 22. Spikelets not sunken in hollows in a thickened corky rhachis:—
 23. Glumes acuminate or awned, rarely only acute; upper lemma not mucronate:—
 24. Leaf-blades linear; racemes dense; culms erect or suberect
Echinochloa
 24. Leaf-blades lanceolate to ovate; racemes loose to moderately dense; culms creeping and ascending
Oplismenus

23. Glumes awnless, if acuminate, then with the upper lemma mucronate:—

25. Upper lemma acute, not mucronate
Paspalidium
25. Upper lemma obtuse, mucronate or very short-awned
Urochloa
22. Spikelets sunken in hollows in a thickened rhachis, the latter disarticulating at maturity
Stenotaphrum
21. Lower glume usually absent; spikelets plano-convex
Paspalum
20. Lower glume turned towards the rhachis, the back of the upper lemma turned away from it, i.e. spikelets adaxial:—
26. Lower glume present
Brachiaria
26. Lower glume absent
Axonopus
18. Lower glume and lowest internode of the rhachilla forming a swollen callus at the base of the spikelet; upper lemma mucronate or short-awned
Eriochloa
17. Spikelets laterally compressed, obliquely ovate; upper glume boat-shaped, with rows of glands or hooked hairs or bristles between the nerves
Pseudechinolaena
16. Lemma of the upper floret thinly cartilaginous, usually with flat hyaline margins:—
27. Spikelets awnless
Digitaria
27. Spikelets awned
Alloteropsis
7. Spikelets with an involucre of bristles or subtended by a solitary bristle and falling with or without the bristles at maturity, solitary or in clusters:—
28. Upper lemma smooth; bristles caducous:—
29. Bristles numerous, formed of highly modified bristle- or spine-like branchlets:—
30. Involucre of free, naked or plumose bristles:—
31. Lemmas heteromorphous; lower often 3-lobed; upper shorter, shining; upper floret readily disarticulating; rhachis with decurrent wings below the insertion of the pedicels
Pennisetum (Eriochaeta)
31. Lemmas more or less alike or lower much reduced; upper floret not deciduous; rhachis ribbed but not conspicuously so, not winged
Pennisetum
30. Involucre of spines or rigid bristles united at the base into a hard cup
Cenchrus
29. Bristles solitary, formed by the prolongation of the branch beyond the terminal spikelet
Pseudoraphis
28. Upper lemma transversely rugose; bristles persistent
Setaria

1. Inflorescence of 1–3 racemes each consisting of a broad, flat and dis-articulating rhachis, bearing on the under surface of each joint shortly peduncled clusters of 1–6 spikelets mixed with small scale-like glumes
Trachys

Acroceras Stapf in Prain, Fl. Trop. Afr. 9, 621 (1920).

Key to the species of *Acroceras*

1. Leaves rounded at the base, not ciliate on the margins below; spikelets close on the main branches
 2. Spikelets over 5 mm long *A. zizanioides*
 2. Spikelets less than 4.5 mm long *A. munroanum*
1. Leaves narrowed to the base, long ciliate on the margins below; spikelets widely spaced on the branches, 4.5–5.5 mm long *A. tonkinense*

1. **Acroceras munroanum** (Balansa) Henr. in Blumea 3, 445 (1940).
Panicum munroanum Balansa in Morot, J. de Bot. 4, 140 (1890).
P. ridleyi Hack. ex Ridley in Trans. Linn. Soc. ser. 2, 3, 400 (1893).
P. crassipiculatum Merr. in Phil. J. Sci. 1, Suppl. 356 (1906).
P. latifolium Hook. f., Fl. Brit. Ind. 7, 39 (1896) in part.
Acroceras crassipiculatum (Merr.) Alston in Trimen, Handb. Fl. Ceyl. 6, Suppl. 324 (1931).

Distribution: Eastern India, Burma, Malaya and Malaysia.

The stems of this species are nearly always prostrate and rooting at the nodes, or sometimes supported above the soil by the nodal roots.

Exsicc.—Thwaites C.P. 3244, Ceylon.

2. **Acroceras tonkinense** (Balansa) C. E. Hubb. ex Bor in Indian For. Rec. (Bot.) 1, 3, 78 (1938).
Panicum tonkinense Balansa in Morot, J. de Bot. 4, 140 (1890).
P. latifolium Linn. var. *majus* Hook. f., Fl. Brit. Ind. 7, 39 (1896).
Neohusnotia tonkinensis (Balansa) A. Camus in Bull. Mus. Hist. Nat. Paris 26, 664 (1920).

Distribution: Assam, Burma into Malaya, Indo-China and Malaysia.

A very fine species with very open panicle and broad leaves with a shining silvery midrib. This is a forest grass, clambering over other vegetation and sending down roots from the nodes.

Exsicc.—Griffith s.n., Mergui; W. G. Craib s.n., Assam.

3. **Acroceras zizanioides** (H.B.K.) Dandy in J. Bot. 69, 54 (1931).
Panicum oryzoides Sw., Nov. Gen. et Sp. Pl. 23 (1788) non *Panicum oryzoides* Arduino (1763).
P. zizanioides H.B.K., Nov. Gen. et Sp. Pl. 1, 100 (1816).
P. balbisianum Schult., Syst. Veg. 2, Mant. 254 (1824).
P. pseudoryzoides Steud., Syn. Pl. Glum. 1, 75 (1854).
Acroceras oryzoides (Sw.) Stapf in Prain, Fl. Trop. Afr. 9, 622 (1920).
Panicum ogowense Franch. in Soc. Hist. Nat. Autun, Bull. 8, 344 (1895).

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Trachys

Acroceras Stapf in Prain, Fl. Trop. Afr. 9, 621 (1920).

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Panicum munroanum Balansa in Morot, J. de Bot. 4, 140 (1890).
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P. crassiapiculatum Merr. in Phil. J. Sci. 1, Suppl. 356 (1906).
P. latifolium Hook. f., Fl. Brit. Ind. 7, 39 (1896) in part.
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Acroceras oryzoides (Sw.) Stapf in Prain, Fl. Trop. Afr. 9, 622 (1920).
Panicum ogowense Franch. in Soc. Hist. Nat. Autun, Bull. 8, 344 (1895).

P. latifolium Hook. f., Fl. Brit. Ind. 7, 39 (1896) in part, non Linn.
P. lutetense K. Schum. in Engl., Bot. Jahrb. 24, 332 (1897).

Distribution: Eastern India, Burma, Tropical Africa and America.

A forest grass growing in openings and along roadsides, often in water or near water.

Exsicc.—N. L. Bor 18404, Naga Hills.

Alloteropsis J. S. Presl ex C. B. Presl, Rel. Haenk.
 343 (1830), t. 47, emend. Hitchc. in Contrib. Unit.
 Stat. Nat. Herb. 12, 210 (1809).

Coridochloa Nees in Edinb. New Phil. J. 15, 381 (1833).

Bluffia Nees, Del. Sem. Hort. Hamb. 8 (1834) et Fl. Afr. Austr. Gram.
 61 (1841).

Holoseium Steud., Syn. Pl. Glum. 1, 118 (1854).

Axonopus Hook. f., Fl. Brit. Ind. 7, 63 (1896) non P. Beauv. (1812).

Key to the species and varieties of *Alloteropsis*

1. Base very thick and covered with silky bases of old sheaths; spikelets 6 mm long, often dark brown; upper lemma with a long arista:—
2. Lower lemma not striped with purple bands

A. semialata var. *semialata*

- see *adclando* 1873
2. Lower ^{lemma} ~~glumes~~ transversely striped with purple bands; spikelets closely packed together

A. semialata var. *eckloniana*

1. Base not thick and not covered with silky bases of sheaths; spikelets 3–4 mm long, usually green; upper lemma abruptly and shortly aristate

A. cimicina

- ✓ 1. *Alloteropsis cimicina* (Linn.) Stapf in Prain, Fl. Trop. Afr. 9, 487 (1919).

Milium cimicinum Linn., Mant. Alt. 184 (1771).

Panicum cimicinum (Linn.) Retz., Obs. Bot. 3, 9 (1783).

Axonopus cimicinus (Linn.) P. Beauv., Ess. Agrost. 12 (1812).

Urochloa cimicina (Linn.) Kunth, Rév. Gram. 1, 31 (1829).

Coridochloa cimicina (Linn.) Nees in Edinb. New. Phil. J. 15, 381 (1833).

Distribution: Throughout India and in the plains and lower foothills, Burma, Ceylon, Tropical Africa and Australia.

This delicate annual is found as a ruderal in waste places, abandoned cultivation and like places. It is grazed by cattle.

Exsicc.—F. Ballard 1469, Ceylon; H. H. Haines 5275, Bengal; J. S. Gamble 23222, Dehra Dun.

2. *Alloteropsis semialata* (R.Br.) Hitchc. in Contrib. U.S. Nat. Herb. 12, 210 (1909).

var. *semialata*.

- Panicum semialatum* R.Br., Prodr. 192 (1810).
Urochloa semialata Kunth, Rév. Gram. 1, 31 (1829).
Oplismenus semialatus Desv., Opusc. 81 (1831).
Axonopus semialatus (R.Br.) Hook. f., Fl. Brit. Ind. 7, 64 (1896).
Aira viatica Griff., Not. 3, 54 (1851).
Holisetum philippicum Steud., Syn. Pl. Glum. 1, 118 (1854).
Arundinella schultzei Benth., Fl. Austr. 7, 545 (1878).
 var. **eckloniana** (Nees) C. E. Hubbard, comb. nov.
Bluffia eckloniana Nees in Lehm., Ind. Sem. Hort. Hamburg 1834, 8 (1834); Nees, Fl. Afr. Austr. 61 (1841).
Panicum semialatum var. *ecklonianum* (Nees) Hack. ex Dur. et Schinz, Consp. Fl. Afr. 5, 764 (1894).
Axonopus semialatus var. *ecklonii* Stapf in Dyer, Fl. Cap. 7, 418 (1899).
Alloteropsis eckloniana (Nees) Hitchc. in Proc. Biol. Soc. Washington 29, 128 (1916).

Distribution: Himalayas from Kumaon eastwards, Naga and Khasi Hills, hills of Manipur and Burma, extending to China, Australia and Tropical Africa. It is a species usually found above 600 m.

An interesting variant is occasionally found. This has a broad membranous wing on the margins of the upper glume. It is probably equally worthy of varietal rank as the colour variant var. *eckloniana*. This form was actually named *Aira viatica* Griffith [Not. Pl. Asiat. 3, 54 (1851)] and figured as *Panicum viaticum* Griffith [Icon. Pl. Asiat. (1851) t. 145, f. 2].

This species is often gregarious in the grasslands of Manipur and is of value as a fodder grass. $2n = 54$.

Exsicc.—Thwaites C.P. 3239, Ceylon; N. L. Bor 211, Assam.

***Axonopus* P. Beauv.**, Essai Agrost. 12, 154 (1812).

Key to the species of *Axonopus*

1. Spikelets elliptic-acute, 2.5 mm long; leaf-blades usually 8–10 mm wide; nodes often bearded *A. compressus*
1. Spikelets elliptic-obtuse or abruptly acute; leaf-blades usually 2–4 mm, rarely to 6 mm wide; nodes glabrous *A. affinis*

1. ***Axonopus affinis* A. Chase** in J. Wash. Acad. Sci. 28, 180 (1938).

Distribution: Originally a native of Tropical America, it is now found in most warm countries.

This grass probably has the same excellent qualities as *A. compressus*, but it is inferior to other desirable grasses, such as *Paspalum dilatatum*, which are grown in parts of the Commonwealth. When *A. affinis* threatens to oust such grasses, it is considered a menace and an objectionable weed. $2n = 80$ (Burton).

Exsicc.—U Thein Lwin s.n., Burma.

✓ 2. ***Axonopus compressus* (Swartz) P. Beauv., Ess. Agrost. 12, 154, 167 (1812).**

Milium compressum Swartz, Prodr. Veg. Ind. Occ. 24 (1788).

Paspalum tristachyon Lamk., Tab. Encycl. Meth. Bot. 1, 176 (1791).

P. platycaulon Poir. in Lamk., Encycl. Meth. Bot. 5, 34 (1804).

Agrostis compressa (Sw.) Poir. in Lamk., Encyc. Meth. Bot., Suppl. 1, 259 (1810) non *A. compressa* Poir. op. cit. 258, nec Willd. (1709).

Paspalum compressum (Sw.) Raspail, Ann. Sci. Nat. Bot. 5, 301 (1825).

P. laticulmum Spreng., Syst. Veg. 1, 245 (1825).

Digitaria platycaulis Desv., Opusc. 62 (1831).

D. domingensis Desv. ex Kunth, Enum. Pl. 1, 49 (1833).

Paspalum guadaloupense Steud., Syn. Pl. Glum. 1, 18 (1854).

P. depressum Steud., loc. cit. 20.

P. filostachyum A. Rich. ex Steud., loc. cit. 20.

Anastrophus compressus Schlecht. ex Doell. in Mart., Fl. Bras. 2, 102 (1877).

A. platycaulis Schlecht. ex Jacks., Ind. Kew. 1, 118 (1893).

Panicum platycaulon (Poir.) O. Ktze., Rev. Gen. Pl. 3, 363 (1898).

Paspalum raunkiaerii Mez in Fedde, Rep. Sp. Nov. 15, 60 (1917).

Distribution: Southern United States, Mexico to Brazil. Introduced into many warm countries.

This species is known as Carpet Grass and has been introduced into India where it has become naturalized. It flourishes on the moist soils of Assam and is particularly common about Dibrugarh. It is a most excellent pasture grass. Encouraged by close grazing it usurps the territory occupied by other grasses. $2n = 40$.

Exsicc.—*N. L. Bor* 193, Assam; *U Thein Lwin* 120, Burma.

***Brachiaria* Griseb. in Ledeb., Fl. Ross. 4, 469 (1853).**

Key to the species and varieties of *Brachiaria*

1. Rhachis more or less flat, herbaceous, sometimes ribbon-like:—
 2. Spikelets solitary, 2.5–3 mm long, densely and untidily crowded in more than two rows on the rhachis; lower branches often branched; base very silky *B. mutica*
 2. Spikelets not as above, uniseriate or biseriate:—
 3. Perennial; spikelets 4 mm long, solitary, regularly seated in two rows on the under surface of a curved rhachis; upper lemma almost smooth *B. decumbens*
 3. Annual; spikelets 3.5 mm long; rhachis straight; upper lemma rugulose *B. burmanica*
1. Rhachis triquetrous, sometimes filiform:—
 4. Lower glume at least two-thirds the length of the spikelet *B. paspaloides*
 4. Lower glume not more than one-half the length of the spikelet:—

5. Panicle linear with erect racemes of closely crowded, softly hairy spikelets 2–2.5 mm long; rhachis hairy; lower glume a minute scale 0.3 mm long; spikelets sometimes tipped with purple

B. eruciformis

5. Panicle various, oblong, lanceolate or spreading; lower glume up to half as long as the spikelet:—

6. Spikelets 1.25–2.5 mm long:—

7. Spikelets 1.25–2 mm long, paired; plant glabrous or slightly hairy; pedicels with long white bristles; lower glume truncate

B. reptans

7. Spikelets 2–2.5 mm long, solitary, all parts more or less hairy or the spikelets sometimes glabrous; lower glume acute or obtuse:—

8. Spikelets elliptic in outline, tapering to both ends, acute, 2.5 mm long, 1–1.25 mm wide; upper glume as long as the spikelet, all parts usually more or less hairy; lower glume acute

B. villosa

- 8a. Lower glume and upper lemma with an apical beard of silvery hairs

B. villosa var. *barbata*

- 8a. Spikelets without such a beard

B. villosa var. *villosa*

8. Spikelets broadly elliptic or obovate-elliptic in outline, very convex, almost hemispherical on the back, 2.25–2.5 mm long, 1.25 mm wide, often gaping; upper glume shorter than the spikelet; leaves and sheaths usually hairy but spikelets glabrous or pubescent; a few long hairs present on the pedicels; lower glume obtuse

B. semiundulata

6. Spikelets 2.5–4.5 mm long or longer:—

9. Spikelets turgid, broadly elliptic-oblong or broadly obovate-elliptic, apiculate, 2.5–6 mm long, 1.5–1.75 mm wide; glabrous or hairy:—

10. All spikelets sessile, uniseriate or biseriate; pedicels solitary, very short, stout; spikelets 4–6 mm long, on the underside of a triquetrous rhachis; perennial

B. brizantha

10. Spikelets pedicellate in pairs; pedicels over 2 mm long; spikelets up to 4 mm long; annuals:—

11. Spikelets 2.5–3 mm long; glumes membranous, dull, at least not shiny, glabrous or hairy, greenish in colour; annuals:—

12. Spikelets or pairs or clusters (secondary racemes) of spikelets approximate, evenly distant by less than their own length, glabrous or hairy; primary pedicels not more than 2 mm long; lower glume usually 5–7-nerved; upper usually 7-nerved, nerves green; pedicels and rhachis with long colourless hairs

B. ramosa

12. Spikelets or pairs of spikelets or secondary racemes very loosely scattered, distant by 10–16 mm, glabrous or hairy; primary pedicels 6–10 mm or more long; lower glume 5-nerved; upper 7-nerved; pedicel and rhachis devoid of long colourless hairs *B. deflexa*
11. Spikelets 3.5–4 mm long, completely glabrous, shining; glumes papyraceous to chartaceous, ivory-coloured; leaves finely and softly pubescent; lower glume 3–5-nerved; upper 5-nerved *B. ovalis*
9. Spikelets not turgid, or if so rhachis not triquetrous:—
 13. Spikelets ovate to lanceolate, acuminate, paired in the lower part of the racemes, 3–4.5 mm long, 1.25–1.5 mm wide, with a few long bristles on the pedicels; rhachis with sparse white bristles; leaves broadly elliptic-acuminate, subcordate at the base; lower glume about one-quarter the length of the spikelet or less *B. setigera*
 13. Spikelets elliptic, oblong to obovate, arranged singly on a flattened or triquetrous rhachis; occasionally spikelets paired at base of racemes:—
 14. Spikelets distant on the branches of a loose panicle:—
 15. Culms weak and decumbent, up to 60 cm tall; branches of the panicle alternate on the axis; none of the branches whorled or verticillate; upper lemma sessile:—
 16. Leaves linear, tapering towards the shortly rounded-base, 6–13 cm long, 4–6 mm wide; spikelets oblong obtuse, 3 mm long, 1–1.25 mm wide, covered with short spaced hairs or subglabrous *B. remota*
 16. Leaves lanceolate, rounded at the base, 4–6 cm long, 8–11 mm wide; spikelets 2.5–3 mm long, 1.3 mm broad, elliptic or elliptic-oblong, acute, widest at the middle; nerves of upper glume well marked *B. kurzii*
 15. Culms robust, up to 250 cm tall; racemes up to 7 cm long, some of the lower sub-verticillate or all alternate; base of the racemes woolly-hirsute at junction with axis; leaves broadly lanceolate, 1.5–1.75 cm broad; upper lemma stipitate *B. semiverticillata*
 14. Spikelets crowded:—
 17. Spikelets secund on the rhachis:—
 18. Spikelets 2.5–3 mm long, widest above the middle, tapering to the base, rounded at the apex to an apiculate tip; peduncle softly hairy; racemes often two, subconjugate *B. distachya*
 18. Spikelets over 3 mm long:—
 19. Peduncle below the inflorescence glabrous; spike-

lets 3.5–4 mm long, elliptic-oblong in shape, gradually tapering to base and apex, almost acuminate *B. subquadrifida*

19. Peduncle below the inflorescence puberulous or glabrous; spikelets 3.25–3.75 mm long, widest above the middle, oblong-obovate, tapering rather abruptly to a sharp point *B. miliiformis*

17. Spikelets not secund on the rachis; inflorescence often of many crowded racemes *B. lata*

✓ 1. ***Brachiaria brizantha*** (Hochst. ex A. Rich.) Stapf in Prain, Fl. Trop. Afr. 9, 531 (1919).

Panicum brizanthum Hochst. ex A. Rich., Tent. Fl. Abyss. 2, 363 (1851).

Distribution: Tropical Africa, but introduced into India as a fodder grass.

I.A.R.I. New Delhi reports that this grass in Indian conditions shows a very vigorous growth and may be of use in soil conservation. It is fairly resistant to drought, but seed setting is very poor.

In Africa it has an excellent reputation as a pasture grass which is much relished by cattle when the young shoots appear after burning. It is also said to be of use for making hay. $2n = 54$.

2. ***Brachiaria burmanica*** Bor in Kew Bull. 1950, 232 (1950).

Distribution: So far appears to be endemic in Burma.

It is probably grazed by cattle.

Exsicc.—Type at Kew (*U Thein Lwin* 526, Rangoon).

3. ***Brachiaria decumbens*** Stapf in Prain, Fl. Trop. Afr. 9, 528 (1919).

Distribution: Tropical Africa, introduced as a fodder grass into India, Australia and elsewhere.

I.A.R.I. New Delhi reports that the plant grows well in India, is fairly resistant to drought, but does not set seed profusely.

✓ 4. (***Brachiaria deflexa*** (Schumach.) C. E. Hubb. ex Robyns in Bull. Jard. Brux. 9, 177 (1932). 181) *see addenda . 1973 .*

Panicum deflexum Schumach., Beskr. Guin. Pl. 63 (1827).

P. regulare Nees, Fl. Afr. Austr. 41 (1841) in obs.

Brachiaria regularis (Nees) Stapf in Prain, Fl. Trop. Afr. 9, 544 (1919).

Distribution: Uttar Pradesh and the Punjab, from the plains up to 1000 m.

In damp places.

In Africa it is said to be drought resistant and a good fodder in dry regions. The grain can be eaten.

Exsicc.—Sri Ram s.n., Uttar Pradesh.

5. ***Brachiaria distachya*** (Linn.) Stapf in Prain, Fl. Trop. Afr. 9, 565 (1919).

Panicum distachyon Linn., Mant. Alt. 183 (1771).

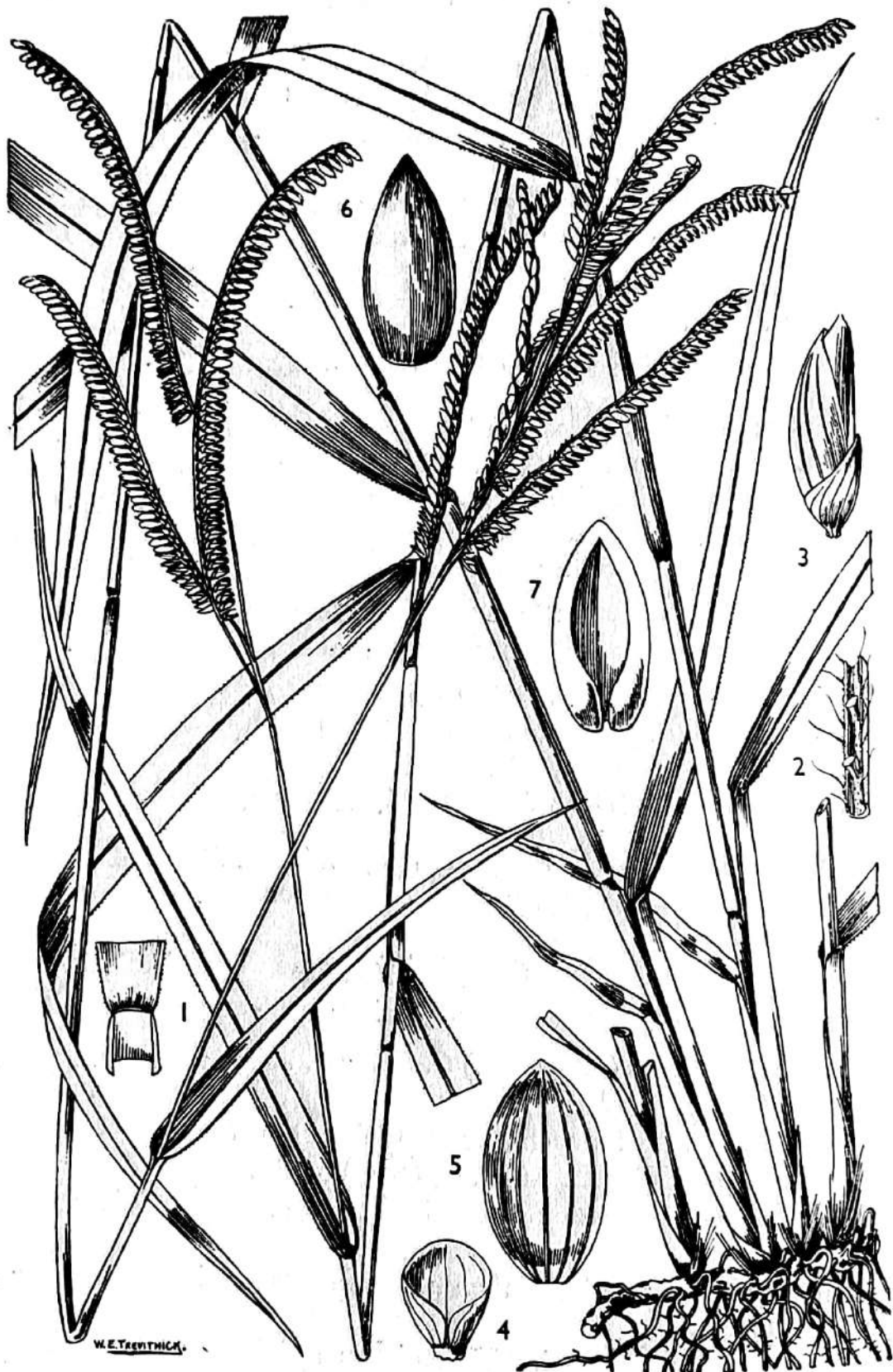


Fig. 32. *Brachiaria brizantha* (Hochst. ex A. Rich.) Stapf
 Plant $\times \frac{1}{2}$. 1, ligule; 2, axis of raceme; 3, spikelet; 4, lower glume; 5, upper
 glume; 6, lemma of upper floret; 7, palea; all $\times 4$.

Digitaria distachya (Linn.) Pers., Syn. Pl. 1, 85 (1805).

Distribution: India, Burma, Ceylon and the Malayan Region to Australia.

A weed of the wayside and waste places, often found in cultivation. It can stand shade to some extent. In Ceylon it has been found on the sand dunes of the coast where it acts as a soil-binder. $2n = 36$ (Krishnaswamy). Exsicc.—J. F. Duthie 4977, Meerut; J. S. Gamble 8957, Bengal.

- ✓ 6. *Brachiaria eruciformis* (J. E. Sm.) Griseb. in Ledeb., Fl. Ross. 4, 469 (1853).

Panicum eruciforme J. E. Sm. in Sibth. et J. E. Sm., Fl. Graeca 1, 44 (1806), t. 59.

Panicum isachne Roth ex Roem. et Schult., Syst. Veg. 2, 458 (1817).

P. caucasicum Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 3, 237 (1834).

P. anisostachium Bojer, Hort. Maur. 364 (1837) nomen.

Echinochloa eruciformis Koch in Linnaea 21, 437 (1848).

Brachiaria isachne (Roth) Stapf in Prain, Fl. Trop. Afr. 9, 552 (1919).

Panicum pubinode Hochst. ex A. Rich., Tent. Fl. Abyss. 2, 363 (1851).

Panicum isachne var. *mexicana* Beal, Grasses North America 2, 114 (1896).

P. wightii Nees, Fl. Afr. Austr. 29 (1841).

Distribution: India westwards to Spain and North Africa.

This species is apparently not of any account as a fodder grass. $2n = 18$ (Avdulov, Janaki Ammal).

Exsicc.—Griffith 6511, Bengal; W. A. Talbot s.n., Kanara; C. B. Clarke 34209, Bihar.

7. *Brachiaria kurzii* (Hook. f.) A. Camus in Lecomte, Fl. Gén. de l'Indo-Chine 7, 438 (1922).

Panicum kurzii Hook. f., Fl. Brit. Ind. 7, 38 (1896).

Distribution: North-east India; Madras.

It is sometimes found in the shade of trees in the neighbourhood of villages in Bengal. It is also found on the top of Parasnath in Bihar, and near streams in Madras. Cattle are said to graze this grass.

Exsicc.—Sri Ram, Uttar Pradesh.

8. *Brachiaria lata* (Schumach.) C. E. Hubb. in Hook., Icones Pl. (1938), sub tab. 3363 in adnot.

Panicum latum Schumach., Beskr. Guin. Pl. 61 (1827).

P. insculptum Steud., Syn. Pl. Glum. 1, 49 (1854).

Urochloa insculpta (Steud.) Stapf in Prain, Fl. Trop. Afr. 9, 599 (1920).

U. lata (Schumach.) C. E. Hubb. in Kew Bull. 1934, 112 (1934).

Distribution: West Tropical Africa extending to north-east Africa and to Arabia.

This species has been introduced into India and is reported to be doing well. It is regarded as a most excellent fodder grass in Africa as it is a very leafy species and is well liked by stock.

9. *Brachiaria miliiformis* (Presl) A. Chase in Contrib. U.S. Nat. Herb. 22, 35 (1920).

Cenchrus Linn., Gen. Pl. ed. 5, 470 (1754) et in
Sp. Pl. ed. 1, 1049 (1753).
Raram Adans., Fam. Pl. 2, 35, 397 (1763).
Cenchropsis Nash in Small., Fl. Southw.
Unit. Stat. 109 (1903).

Key to the species of *Cenchrus*

1. Bristles or spines of the involucre antrorsely scabrid:—
 2. Bristles connate at the base only:—
 3. Annuals; involucre with a wide naked connate base; inner bristles stouter at the base, subequal, ciliate on both margins; outer long, flexuous, scabrid, up to 2 cm long *C. prieurii*
 3. Perennials; base of the involucre small, elliptic, naked; inner bristles not very stout at the base, ciliate on the margins, not more than 1.5 cm long *C. ciliaris*
 2. Bristles connate into a cup 1–3 mm long:—
 4. Cup up to 4 mm in diameter; surface not woolly:—
 5. Inner bristles very slender, widened into a cup at the base, tapering to a setiform tip; the outer bristles slender, numerous *C. pennisetiformis*
 5. Inner bristles rigid, flattened and subulate, acute at the tip, not drawn out; the outer few or absent *C. setigerus*
 4. Cups 6–8 mm in diameter; surface finely pubescent *C. pauciflorus*
 1. Bristles or spines of the involucre retrorsely scabrid:—
 6. Bristles numerous, connate at the base only; outer in one row, eventually spreading or reflexed, hook-like; inner glabrous on the back *C. biflorus*
 6. Bristles comparatively few, connate, forming a deep cup, very rigid subulate, spiny; inner bristles very broad, usually very hairy at the base dorsally *C. echinatus*
- ✓ 1. **Cenchrus biflorus** Roxb., Fl. Ind. 1, 238 (1820).
Cenchrus barbatus Schumach., Beskr. Guin. Pl. 43 (1827).
C. catharticus Delile, Cat. Hort. Monsp. 1838, 4 (1839); in Linnaea 13, in Litt.-Bericht, 103 (1839).
C. annularis Anderss. in Peters, Reise Mossam. Bot. 553 (1864).
Distribution: Upper Gangetic Plain. Also found in Africa.
When young a grass acceptable to stock. The seeds are eaten in times of famine in Africa.
Exsicc.—Harsukh 20702, Punjab; Bourne 2465, Madras.
- ✓ 2. **Cenchrus ciliaris** Linn., Mant. Alt. 302 (1771).
Pennisetum cenchroides Rich. in Pers. Syn. 1, 72 (1805).
Panicum vulpinum Willd., Enum. Hort. Berol. 1031 (1809).
Setaria vulpina (Willd.) P. Beauv., Ess. Agrost. 51 (1812).

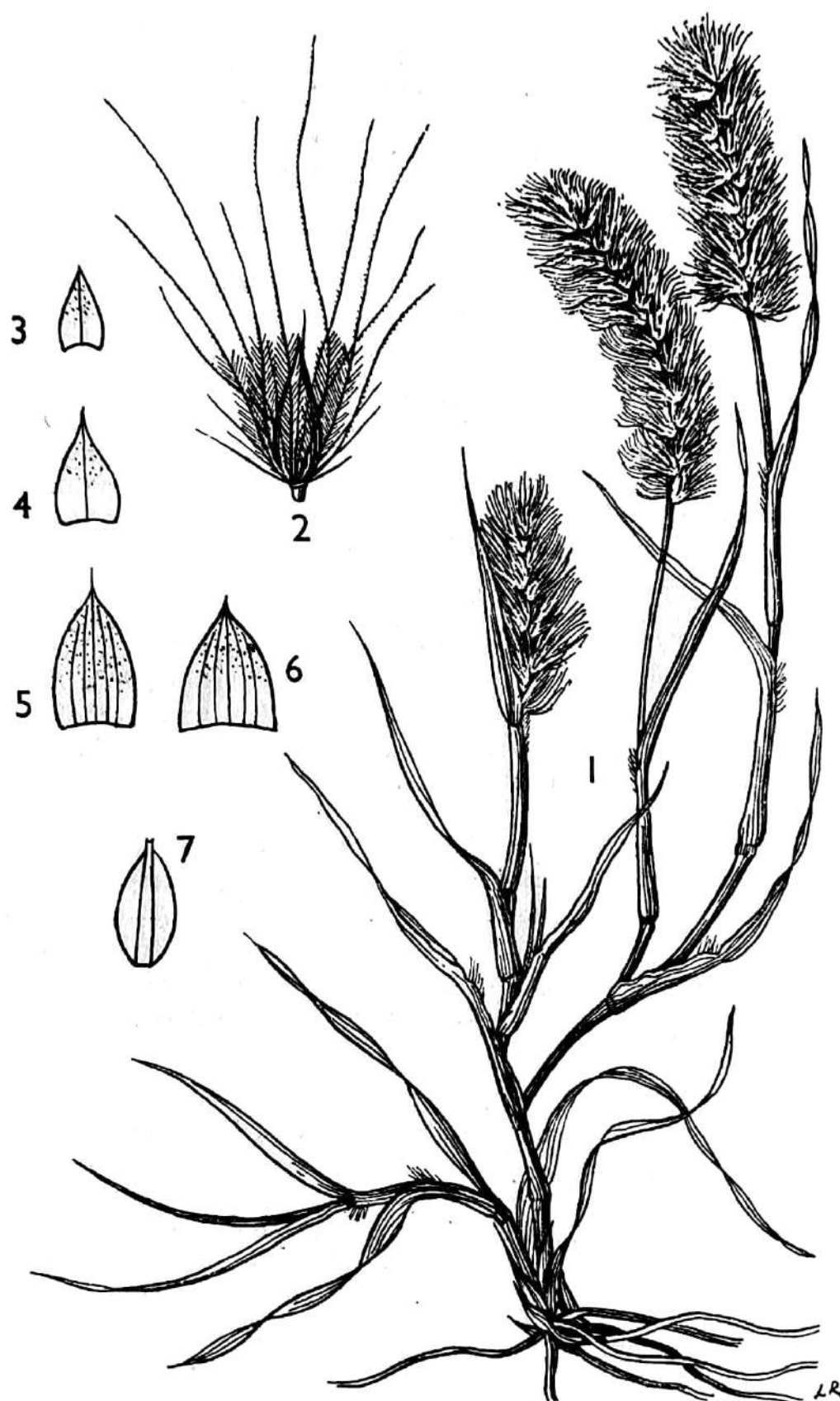


Fig. 33. *Cenchrus ciliaris* Linn.

1, plant $\times \frac{1}{2}$; 2, spikelet with supporting bristles (sterile branches); 3, lower glume; 4, upper glume; 5, lower lemma; 6, upper lemma; 7, palea of upper lemma; all $\times 4$.

6. **Cenchrus prieurii** (Kunth) Maire in Bull. Mus. Hist. Nat. Paris, sér. 2, 3, 523 (1931).

Pennisetum prieurii Kunth, Révis. Gram. 2, 411 (1831), t. 119.

P. breviflorum Steud., Syn. Pl. Glum. 1, 107 (1854).

Cenchrus macrostachyus Hochst. ex Steud., loc. cit. 109.

Distribution: North-west India, extending to Tropical Africa.

An excellent fodder grass in semi-desert regions. The grain can also be eaten in times of want.

Exsicc.—Drummond 21191, Punjab.

✓ 7. **Cenchrus setigerus** Vahl, Enum. Pl. 2, 395 (1806).

C. tripsacoides R.Br. in Salt, Abyss. App. 63 (1814) nomen.

Pennisetum vahlii Kunth, Rév. Gram. 1, 49 (1829).

Cenchrus montanus Nees ex Royle, Ill. Bot. Him. 416 (1840) nomen.

C. bulbifer Hochst. ex Boiss., Fl. Or. 5, 448 (1884).

C. uniflorus Ehr. ex Boiss., loc. cit. 448.

C. biflorus of the Fl. Brit. Ind. 7, 89 (1896) non Roxb. (1820).

Distribution: North-west India, widespread in north-east Tropical Africa, $2n = 34$.

Exsicc.—R. R. Stewart 12512, Punjab; W. T. Stearn 14, Sind.

✓ **Cenchrus glaucus** Mudaliar et Sundaraj in J. Bombay Nat. Hist. Soc. 54, 926 (1958).

This grass, which has not been seen, is said to differ from *C. ciliaris* Linn. in its rough, glaucous leaves, stiff culms, dense panicle, and other minor particulars. It is a hardy, drought-resistant grass forming large tussocks.

Distribution: Madras, endemic.

Cyrtococcum Stapf in Prain, Fl. Trop. Afr. 9, 745 (1920).

Loxostachys A. Peter in Fedde, Rep. Sp. Nov. 40, Beiheft 203 (1930).

Key to the species of *Cyrtococcum*

1. Pedicels short, rarely as long as the spikelets:—

2. Leaves elliptic-acute, linear-acute or lanceolate-acute, mostly 2.5–3 cm long, exceptionally up to 6 cm long; spikelets hispidulous; branches of the panicle glabrous *C. trigonum*

2. Leaves oblong-elliptic, lanceolate, acuminate, usually over 10 cm long, very rarely below 6 cm long; spikelets glabrous; branches of the panicle often pilose *C. oxyphyllum*

1. Pedicels longer than the spikelets:—

3. Spikelets 1.75–2 mm long; glumes not cuspidate *C. deccanense*

3. Spikelets 1.5 mm long or less; if longer, glumes cuspidate:—

4. Glumes and lower lemma smooth:—

5. Lower lemma obtuse:—

6. Panicle very lax; pedicels fairly long *C. accrescens*

- | | |
|---|---------------------|
| 6. Panicle contracted; pedicels shorter | <i>C. patens</i> |
| 5. Lower lemma and glume cuspidate | <i>C. longipes</i> |
| 4. Glumes and lower lemma verrucose | <i>C. muricatum</i> |

- ✓ 1. ***Cyrtococcum accrescens* (Trin.) Stapf** in Hook., Icon. Pl. (1922) sub tab. 3096.

C. patens var. *latifolium* (Honda) Ohwi in Acta Phytotax. Geobot. **11**, 47 (1942).

Panicum accrescens Trin., Sp. Gram. Ic. **1** (1828), t. 88.

Distribution: Tropics of South-east Asia, ascending in the hills to 1500 m.

This is a grass which must have moisture and shade. It is often gregarious in openings in the jungle.

Exsicc.—J. S. Gamble 24660, Dehra Dun; N. L. Bor 16337, Naga Hills.

- ✓ 2. ***Cyrtococcum deccanense* Bor** in Kew Bull. **1956**, 255 (1956).

Panicum patens of the Fl. Brit. Ind. **7**, 57 (1896) non Linn. (1753).

Distribution: Madras and Ceylon in the hills.

Hooker mentions this species on page 58 of the *Flora of British India* as being a small variety (?) with large spikelets. It is quite distinct and has a local distribution. Like its congeners it succeeds in damp places and can thrive in dense shade.

Exsicc.—Type at Kew (*F. Ballard* 1341, Ceylon).

3. ***Cyrtococcum longipes* (Wight et Arn.) A. Camus** in Bull. Mus. Hist. Nat. Paris **27**, 118 (1921).

Panicum longipes Wight et Arn. ex Hook. f., Fl. Brit. Ind. **7**, 58 (1896).

Aira capillaris Heyne ex Hook. f., loc. cit. 58, nomen.

Distribution: Nilgiris, Pulney Hills.

A grass found in damp shady places, often in evergreen forest.

Exsicc.—Type at Kew (*Herb. Wight*. 1638, Madras).

4. ***Cyrtococcum muricatum* (Retz.) Bor**, comb. nov.

Panicum muricatum Retz., Obs. Bot. **4**, 18 (1786).

P. schmidtii Hack. in Bot. Tidsskr. **24**, 99 (1901).

Cyrtococcum schmidtii (Hack.) Henr. in Blumea **3**, 436 (1940).

The type of *Panicum muricatum* Retz. is in the Retzius Herbarium at Lund and has been seen. The lower lemma and upper glume are covered with warty growths and it is exactly the same as Hackel's *Panicum schmidtii* for which Henrard made the combination *Cyrtococcum schmidtii*. The epithet *schmidtii* must give way to the much earlier *muricatum*, but it is doubtful if the warts on lemma and glume really have specific value. Apart from the warts the species resembles *C. patens* (Linn.) A. Camus closely.

Distribution: Southeast Asia.

Exsicc.—Type sheets of *Panicum muricatum* (Lund) and *P. schmidtii* (Copenhagen).

- ✓ 5. ***Cyrtococcum oxyphyllum* (Steud.) Stapf** in Hook., Ic. Pl. sub tab. 3096 (1922).

Panicum oxyphyllum Steud., Syn. Pl. Glum. 1, 65 (1854).

P. hermaphroditum Steud., loc. cit. 67.

P. pilipes Nees et Arn. ex Buese in Miq., Pl. Junghn. 3, 376 (1854).

Distribution: China, north-east India, Bombay, Madras, Ceylon, Burma, Malaysia.

This is a forest grass, revelling in damp shady places.

Exsicc.—*Barber* 5094, Madras; *F. Ballard* 1427, Ceylon; *J. F. Duthie* 10627, Madhya Pradesh.

✓ 6. ***Cyrtococcum patens* (Linn.) A. Camus** in Bull. Mus. Hist. Nat. Paris 27, 118 (1921).

Panicum patens Linn., Sp. Pl. ed. 1, 58 (1753).

P. radicans Retz., Obs. Bot. 4, 18 (1786).

Cyrtococcum radicans (Retz.) Stapf in Hook., Icon. Pl. (1922) sub tab. 3096.

Panicum obliquum Roth ex Roem. et Schult., Syst. Veg. 2, 433 (1817).

P. carinatum J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 309 (1830).

Distribution: Widespread in Southeast Asia.

Exsicc.—*Wallich* 8740, Madras; *Griffith* 6507, Burma; *N. L. Bor* 6167, Naga Hills.

✓ 7. ***Cyrtococcum trigonum* (Retz.) A. Camus** in Bull. Mus. Hist. Nat. Paris 27, 118 (1921).

Panicum trigonum Retz., Obs. Bot. 3, 9 (1783).

P. difforme Roth ex Roem. et Schult., Syst. Veg. 2, 433 (1817).

Distribution: Madras and Ceylon extending to south-east Asia.

Often found in dense shade in damp places where it forms a mat.

Exsicc.—*Bourne* 6422, Madras; *A. H. G. Alston* 1073, Ceylon.

***Digitaria* Heist. ex Fabricius**, Enum. ed. 1, 207 (1759).

Gramerium Desv., Opusc. 61 (1831).

Syntherisma Walt., Fl. Carol. 76 (1788).

Panicum spp. auctt.

Key to the species and varieties of *Digitaria*

1. Basal sheaths disintegrating into fibres *D. fibrosa*
1. Basal sheaths not so disintegrating:—
 2. Inflorescence a genuine, very effuse and divaricate panicle as long as broad without verticillate branches or branchlets; spikelets dispersed throughout the panicle on solitary, long pedicels (*Leptoloma*) *D. tomentosa*
 2. Inflorescence of spike-like racemes, solitary, conjugate, digitate or verticillate in whorls along a more or less elongate common axis, never genuinely effuse; spikelets binate, ternate or in small groups:—

3. Racemes espiculate at the base, very long, numerous, pennately hairy at the base, straight, stiff, with distant pairs of spikelets (Pennatae) *D. pennata*
3. Racemes not as above, not pennately hairy, variously placed along a common axis if present, or umbellate:—
4. Hairs present on the spikelets and always verrucose, i.e. covered with minute warty growths as if sprinkled with fine grains of sand (Verrucipilae):—
5. Annuals:—
 6. Culms erect; leaves all linear; inflorescence of 2–6 racemes 4–10 cm long; fruit at length purplish *D. violascens*
 6. Culms creeping and rooting at the nodes; leaves of the innovations rather broad; inflorescence of 2–3 racemes, 1.5–7 cm long; fruit not purple, pale *D. longiflora*
5. Perennials, sometimes much decumbent at the base and rooting at the nodes:—
 7. Spikelets 2–2.5 mm long; fruit chestnut-brown; buds at the base covered with silky cataphylls; culms 40–50 cm tall *D. thwaitesii*
 7. Spikelets less than 2 mm long; stems decumbent and rooting at the nodes; fruit yellowish-brown to brown; culms not more than 20 cm tall:—
 8. Sheaths densely and softly hirsute; nodes bearded; spikelets oblong-ovate, at least 1.5 mm long; fruit brownish; lower lemma hairy between all the nerves *D. preslii*
 8. Sheaths glabrous or sparingly pubescent; nodes glabrous; spikelets lanceolate-ovate, often less than 1.5 mm long; tip of fruit not protruding beyond lower lemma; lower lemma glabrous in the two interspaces on each side of the central nerve *D. longiflora*
4. Hairs on the spikelets, if any, never verrucose:—
 9. Hairs on the spikelets clavate, i.e. passing abruptly into an obtuse, obovate or globular head, much broader than the hair (Clavipilae):—
 10. Tips of the pedicels cupuliform with hairs on the rim and below; hairs exceeding the summit:—
 11. Upper glume very short or up to two-thirds of the length of the spikelet only, or nearly absent; erect annuals; spikelets 1.25 mm long:—
 12. Indumentum of clavate hairs definite:—
 - 12a. Upper glume distinct *D. stricta* var. *stricta*
 - 12a. Upper glume absent *D. stricta* var. *denudata*
 12. Indumentum of clavate hairs almost or quite absent *D. stricta* var. *glabrescens*

GRASSES OF INDIA, BURMA AND CEYLON

11. Upper glume well developed, at least two-thirds the length of the spikelet; spikelets 2.25 mm long; broadly elliptic
D. ternata
10. Tips of the pedicels somewhat thickened, without a rim of hairs:—
13. Tip of the fruit distinctly apiculate and protruding above the lower lemma; racemes 6–7 cm long, usually alternate; leaves 7–8 cm long, 3 mm broad, acute at tip
D. granularis
13. Tip of the fruit not protruding:—
14. Rhachis of the racemes broadly winged, ribbon-like; spikelets 2 mm long
D. ischaemum
14. Rhachis of the racemes filiform, hardly winged:—
15. Spikelets 2 mm long; panicle not over 15 cm long; nerves of the lower lemma 5; hairs apiculate, slightly swollen at tips
D. siamensis
15. Spikelets 1.5 mm long; panicle up to 30 cm long; nerves of the lower lemma usually 3, sometimes 5; hairs coarsely clavate giving the spikelet a granular appearance
D. jubata
9. Hairs on the spikelets, if any, without a globular thickening, not clavate:—
16. Spikelets in triads in the centre of the racemes:—
17. Spikelets perfectly glabrous or nearly so, rather small, 1.4–2 mm long; basal sheaths not disintegrating into fibres:—
18. Tip of pedicel with longish hairs
D. stricta var. *glabrescens*
18. Tip of pedicel without hairs (Atrofuscae):—
19. Perennial, with long creeping stolons, very like *D. longiflora* but spikelets quite glabrous; tip of fruit visible beyond lower lemma; upper glume 3–5-nerved, more or less equal to the lower lemma; nodes hairy; spikelets 1.4–1.6 mm long
D. fuscescens
19. Annual; upper glume 3-nerved, translucent, shorter than the lower lemma; nodes glabrous; spikelets 2 mm long
D. stewartiana
17. Spikelets distinctly hairy:—
20. Basal sheaths breaking up into fibres; perennials
D. fibrosa
20. Basal sheaths not breaking up into fibres; annuals
D. ischaemum
16. Spikelets in pairs in the centre of the racemes:—
21. Inflorescence an oblong open panicle, much longer than broad, up to 13 cm long, 3–6 cm broad; racemes not

digitate; lower glume quite absent (Remotae)

21. Inflorescence not lax or open but with solitary, conjugate or whorled racemes; spikelets congested or at least close together; lower glume absent or present:—
D. wallichiana
22. Upper glume and lower lemma equal in length, both often as long as the upper lemma; spikelets very woolly or hairy, the hairs much exceeding the upper lemma (Laniflorae)
D. brownii
22. Upper glume not more than three-quarters the length of the spikelets, often very short; hairs on the spikelet if present not extending beyond the tip (Parviglumae):—
23. Upper glume a nerved or nerveless triangular scale 0.33–0.75 mm long; spikelets elliptic-acute to narrowly lanceolate-acute; lower glume absent:—
24. Racemes densely pubescent in the lower axils, with or without a few long white hairs, and a few such hairs here and there on the rhachis; spikelets 2–2.5 mm long, shortly pubescent on the margins and lateral interspaces, elliptic-acute, i.e. widest at the middle; upper glume 3-nerved; nerves on lower lemma very prominent
D. setigera
25. Spikelets 2.5 mm long, without bristles on the lower lemma
subsp. *setigera*
25. Spikelets 2.75 mm long; lower lemma with stiff bristles
subsp. *marathensis*
24. Racemes puberulous only in the axils or nearly glabrous, never with long hairs on the rhachis (see *D. biformis* subsp. *willdenowii* var. *rachiseta*)
26. Upper glume an obtuse, rounded, very short, nerveless, hyaline scale with long hairs at the tip; lower lemma glabrous; spikelets 2.5 mm long, lanceolate-elliptic-oblong; base of the culms with silky cataphylls; racemes 2 (rarely 3) only
D. duthieana
26. Upper glume a triangular, 3-nerved scale, very short, 0.3–0.6 mm long, hairy at sides and tip; lower lemma more or less villous; spikelet lanceolate, i.e. widest below the middle, 3 mm long; base of the culms without silky cataphylls; racemes flabellate or corymbose on a long or short common axis, 2–10 in number, erect then spreading
D. microbachne

27. Lower lemma with bristles as well as hairs
subsp. *calliblepharata*
27. Lower lemma with hairs only
subsp. *microbachne*
23. Upper glume well developed, mostly one-half to three-quarters, at least one-third, the length of the spikelet; if occasionally less developed or very short, either the spikelet ovate in shape with an apiculate fruit protruding or nerves of the lower lemma scabrid; lower glume present or absent:—
28. Racemes with interrupted loose groups of spikelets; pedicels of upper spikelets up to 5 mm long, scabrid; lower glume sometimes missing in the upper spikelets, usually present as a minute-triangular scale (Horizontales) *D. griffithii*
28. Racemes conjugate, digitate or a few false whorls in succession; common axis if present rather short and much overtopped by the racemes; lower glume always present and well developed:—
29. Culms bulbously thickened at the base which is covered with densely silky-villous cataphylls (Erianthae):—
- 29a. Upper glume almost as long as the spikelet; plants rhizomatous *D. nodosa*
- 29a. Upper glume not more than three-quarters the length of the spikelet; plants stoloniferous *D. pentzii*
29. Culms not thickened at the base and without villous cataphylls:—
30. Spikelets of each pair heteromorphous, sessile spikelets nearly glabrous in front; the pedicelled coated with long hairs often spreading at maturity (Biformes):—
31. Racemes thin and flexible, nodding, usually more than 3; lower lemma of the subsessile spikelet with prominent nerves *D. biformis*
32. Lower lemma of pedicelled spikelet with hairs and bristles
subsp. *willdenowii*
Rhachis with long white hairs
var. *rachiseta*
32. Lower lemma with hairs only
subsp. *biformis*
31. Racemes rather stout, very stiff, often only 2, divaricate; lower lemma of sessile

spikelet with very prominent nerves, the internerve spaces often slit-like

D. bicornis

33. Lower lemma of pedicelled spikelet with bristles as well as hairs

subsp. *lamarckiana*

33. Lower lemma with hairs only

subsp. *bicornis*

30. Spikelets of each pair not heteromorphous, both spikelets of each pair with the same type of indumentum (Sanguinales):—

34. Nerves of the lower lemma smooth, without minute triangular spines on nerves:—

35. Fruit distinctly apiculate and protruding above the lower lemma; spikelets often broad and turgid; upper glume very broad and rounded at the summit; spikelets rather loosely arranged on the rhachis

D. cruciata

35. Fruit not apiculate, acute only; spikelets lanceolate, elliptic or narrow, not turgid; upper glume narrow, triangular-acute:—

36. Annuals:—

37. Spikelets very narrowly lanceolate or linear-lanceolate, 3 mm long, 0.6–0.75 mm broad, with apparently only 3 nerves visible on the lower lemma; upper glume half as long as the spikelet or less; racemes very few

D. timorensis

37. Spikelets elliptic - lanceolate, oblong-elliptic or ovate-elliptic, 2.5–3 mm long, with 5–7 nerves visible on the lower lemma; upper glume half as long as the spikelets or longer:—

38. Spikelets without spreading hairs

D. adscendens *ciliaris*

38. Spikelets with spreading hairs:—

see *adulanda*
1973

39. Hairs of one kind, no tubercle-based bristles present

subsp. *adscendens* var. *criniformis*

39. Tubercle-based bristles present
subsp. *chrysoblephara*

36. Perennial; loosely or densely tufted, sending out numerous stolons rooting at the nodes; rhachis of the racemes broadly winged; spikelets 2.5–2.75 mm long; lower glume distinct; upper 2 mm long; nerves on lower lemma very prominent giving a ribbed appearance

D. didactyla var. *decalvata*

34. Nerves of the lower lemma with minute triangular spines on the upper part of the nerves; spikelets 2.5–3 mm long; upper glume half as long as the spikelets or a little longer:—

40. Spikelets hairy *D. sanguinalis*
subsp. *vulgaris* var. *rottleriana*

40. Spikelets entirely glabrous

D. sanguinalis
subsp. *aegyptiaca* var. *frumentacea*

D. ciliaris (Retz.) Koel

see
addenda
1973

- ✓ 1. (*Digitaria adscendens*) (HBK) Henr. in Blumea 1, 92 (1934)
Asperella digitaria Lamk., Tab. Encycl. Meth. Bot. 1, 167 (1791).
Panicum adscendens HBK., Nov. Gen. et Sp. Pl. 1, 97 (1816).
Digitaria chinensis Horn., Suppl. Hort. Bot. Hafn. 8 (1819).
Panicum ornithopus Trin. ex Spreng., Neue Entdeck. 2, 83 (1821).
Digitaria marginata Link, Enum. Hort. Berol. 1, 102 (1821).
Paspalus inaequalis Link, loc. cit. 103.
Digitaria commutata Schult., Syst. Veg. 2, Mant. 262 (1824).
Digitaria inaequalis (Link) Spreng., Syst. Veg. 1, 271 (1825).
D. australis Willd. apud Trin., Gram. Panic., 80 (1826).
D. brevifolia Link, Hort. Berol. 1, 225 (1827).
D. fimbriata Link, loc. cit. 226.
Panicum fimbriatum (Link) Kunth, Rév. Gram. 1, 33 (1829).
P. brevifolium (Link) Kunth, loc. cit. 32 non Linn. (1753).
P. glaucescens Nees, Agrost. Bras. 100 (1829).
P. neesii Kunth, Rév. Gram. 1, 33 (1829).
P. brachyphyllum Steud., Syn. Pl. Glum. 1, 42 (1854).
P. sanguinale Linn. var. *longiglume* f. *marginatum* (Link) Doell in Martius, Fl. Bras. 2, 2, 133 (1877).
Syntherisma fimbriata (Link) Nash in Bull. Torr. Bot. Club 25, 302 (1898).
Digitaria henryi Rendle in J. Linn. Soc. (Bot.) 36, 323 (1904).
Syntherisma marginatum (Link) Nash in North Amer. Flor. 17, 154 (1912).

Distribution: Endemic in Madras State.

In this species the upper and lower glumes are almost absent and their protective role is taken over by the lower lemma which is wrapped round the fruit so that only a small area of it is exposed. As the species is somewhat rare, it is not likely to be of any importance as a fodder grass.

Exsicc.—*Bourne* 2462, Madras.

✓ 28. *Digitaria violascens* Link, Hort. Berol. 1, 229 (1827).

Paspalum fuscum J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 214 (1830).

Syntherisma fusca (Presl) Scribner in Tenth Ann. Rept. Miss. Bot. Gdn. 49 (1899), t. 11.

Digitaria chinensis (Nees) A. Camus in Lecomte, Not. Syst. 4, 48 (1923) non Horneman (1819).

D. fusca (Presl) Merr. in Philipp. J. Sc. 35, 4 (1928) non Chiovenda (1919).

Distribution: Tropical regions of both hemispheres.

This beautiful grass is of frequent occurrence in India and as it is often very leafy it must be considered as forming an important part of the available fodder.

Exsicc.—*Griffith* 6521, Assam; *J. S. Gamble* 20662, Madras.

29. *Digitaria wallichiana* (Wight et Arn.) Stapf in Prain, Fl. Trop. Afr. 9, 436 (1919).

Panicum wallichianum Wight et Arn. ex Steud., Syn. Pl. Glum. 1, 41 (1854).

P. multibrachiatum Hochst. ex Steud., loc. cit. 74.

Paspalum perrottetii Hook. f., Fl. Brit. Ind. 7, 20 (1896) non *Panicum perrottetii* Kunth.

Distribution: Madras, Ceylon.

This species is only found in mountainous areas in Madras and Ceylon, where it is doubtless eaten by all grazing animals.

Exsicc.—*F. Ballard* 1207, Ceylon; *Meebold* 9429, Madras.

***Echinochloa* P. Beauv., Essai Agrost. 53, 161 (1812).**

Key to the species and varieties of *Echinochloa*

1. Ligule a fringe of stiff hairs, at least in the lower leaves:—
 2. Spikelets acute or shortly cuspidate, 3–4 mm long, unawned; perennial *E. pyramidalis*
 2. Spikelets acuminate, long-awned, 5–7.5 mm long; perennial or annual *E. stagnina*
1. Ligule entirely absent:—
 3. Spikelets 3–4 mm long, densely crowded, unawned; tall, robust grass; spikes thickened, sometimes incurved; grains not deciduous *E. frumentacea*

3. Spikelets up to 5 mm long (if densely crowded, 3–3.5 mm long and awned); grains deciduous:—
4. Spikelets 4.5–5 mm long, almost glabrous; lower lemma subcoriaceous, shining *E. glabrescens*
4. Spikelets more or less hispidulous or hairy, or if glabrescent lower lemma not coriaceous:—
5. Lower lemma and upper glume equally acute or cuspidate, not awned; spikes rather distant, 1–2 cm long; spikelets 2.5–3 mm long *E. colonum*
5. Lower lemma and upper glume acuminate, cuspidate, the former often produced into a considerable awn:—
6. Spikelets 3–4 mm long (excluding the cusp or awn) cuspidate or more or less awned from the tip of the lower lemma, conspicuously hispid; panicles erect, rather stiff:—
7. Lower lemma cuspidate or shortly awned *E. crusgalli* var. *brevisetia*
7. Lower lemma long to moderately long-awned *E. crusgalli* var. *crusgalli*
6. Spikelets 2.5–3 mm long (excluding the cusp or awn), usually awned, inconspicuously hispid; panicle much more dense than that of *E. crusgalli* with more numerous racemes and very crowded spikelets; panicles soft, nodding *E. cruspavonis*

- ✓ 1. ***Echinochloa colonum*** (Linn.) Link, Hort. Berol. 2, 209 (1833).
Panicum colonum Linn., Syst. Nat. ed. 10, 2, 870 (1759).
Milium colonum (Linn.) Moench, Method. Pl. 202 (1794).
Oplismenus colonum (Linn.) H.B.K., Nov. Gen. et Sp. 1, 108 (1816).
Panicum zonale Guss., Fl. Sic. Prodr. 1, 82 (1827).
P. incertum Bosc ex Steud., Nom. Bot. ed. 2, 2, 258 (1841) nomen.
Oplismenus repens J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 321 (1830).
Echinochloa zonalis (Guss.) Parl., Fl. Panorm. 1, 119 (1845).
Panicum prorepens Steud., Syn. Pl. Glum. 1, 46 (1854).
Echinochloa crusgalli subsp. *colonum* Honda in Bot. Mag. Tokyo 37, 122 (1923).

Panicum crusgalli subsp. *colonum* Makino et Nemoto, Fl. Jap. 1470 (1925.)
 Distribution: Widely spread in the tropics of Asia and Africa.

It is usually found in damp rich soils where its growth is very rapid and a large amount of lush foliage is produced. It is greedily grazed by all kinds of stock, while the grain is eaten by the poorer people. When in the young state this grass closely resembles the young rice plant, and consequently is considered to be an obnoxious pest in ricefields. The correct form of the specific epithet is *colonum*, a contraction of *colonorum*, and not *colona*. $2n = 36, 48, 54, 72$ (Janaki Ammal).

Exsicc.—Bourne 4739, Madras; *U Thein Lwin* 15, Burma; *N. L. Bor* s.n., Assam.



Fig. 34. *Echinochloa colonum* (Linn.) Link
 Plant $\times \frac{1}{4}$. 1, spikelet, abaxial view; 2, spikelet, side view; 3, upper lemma from the back; 4 and 5, grain, view of embryo and side view; all $\times 6$.

Eriochloa Kunth in *Humb. et Bonpl.*, Nov. Gen. et Sp. 1, 94 (1816), t. 30, 31.

Helopus Trin., Fund. Agrost. 103 (1820).

Oedipachne Link, Hort. Reg. Bot. Berol. 1, 51 (1827).

Aglycia Willd. ex Steud., Nom. Bot. ed. 2, 1, 37 (1840).

Alycia Willd. ex Steud., loc. cit., 66.

Monachne P. Beauv., Essai Agrost. 49, 168 p.pt. (1812), t. 10, fig. 9.

Key to the species of *Eriochloa*

1. Spikelets 2.5–3.5 mm long, elliptic-acute or ovate-acute, not awned; axis not hairy *E. procera*
1. Spikelets about 4–4.5 mm long, elliptic-acuminate, shortly but distinctly awned; axis and pedicels hairy, often long-hairy *E. nubica*

✓ 1. **Eriochloa procera** (Retz.) C. E. Hubbard in Kew Bull. 1930, 256 (1930).

Agrostis procera Retz., Obs. Bot. 4, 19 (1786).

Milium ramosum Retz., Obs. Bot. 6, 22 (1791).

Paspalum annulatum Fluegge, Gram. Monogr. 133 (1810).

Agrostis ramosa Poir. in Lamk., Encycl. Meth. Bot. Suppl. 1, 257 (1810).

Eriochloa annulata (Fluegge) Kunth, Rév. Gram. 1, 30 (1829).

E. polystachya Hook. f., Fl. Brit. Ind. 7, 20 (1896) non H.B.K., Nov. Gen. et Sp. 95 (1816).

E. ramosa O. Ktze., Rev. Gen. Pl. 2, 775 (1891).

Distribution: Plains of India, Burma, Ceylon and South-east Asia generally, also in tropical Africa.

This species has a wide distribution but is nowhere very common. It often favours damp places, ditches and the edges of paddy fields.

Exsicc.—J. S. Gamble 12198, Madras; J. R. Drummond 21136, Punjab; N. D. Simpson 9368, Ceylon.

✓ 2. **Eriochloa nubica** (Steud.) Hack. et Stapf ex Thell. in Vierteljschrft. Nat. Ges. Zürich 64, 697 (1919).

Helopus nubicus Steud., Syn. Pl. Glum. 1, 100 (1854).

Eriochloa acrotricha (Steud.) Hack. ex Thell. in Vierteljschrft. Nat. Ges. Zürich 52, 435 (1907).

E. decumbens F. M. Bail. in Queensland Agric. J. 1, 234 (1897).

Helopus acrotrichus Steud., Syn. Pl. Glum. 1, 100 (1854).

Distribution: Tropical Africa—introduced into India. Also found in Australia.

This grass seems to be able to adapt itself to dry or wet conditions, being found in the Sudan in dry arid localities and also in inundated fields in Central Africa. It is eaten by all stock.

C. E. Hubbard in a note on a sheet in the Kew Herbarium, records: "*E. acrotricha* (Hook. f.) Hack. was first based on *Panicum acrotrichum* Hook. f., a distinct species of *Panicum*, in 1905. In 1907, he (Hackel) used the name again, basing it on *Helopus acrotrichus* Steud." Therefore the epithet *acrotricha* in *Eriochloa* is invalid.

There is a specimen of *Eriochloa punctata* (Linn.) Ham. in Koenig's herbarium at Lund. The species is not referred to in the *Observationes* and it is unlikely that it was collected in India since it is a native of the West Indies. It is distinguished from the species cited here by the possession of an awn 1 mm long.

Holcolemma Stapf et C. E. Hubb. in Kew Bull.
1929, 244 (1929).

1. **Holcolemma canaliculatum** (Steud.) Stapf et C. E. Hubb. in Kew Bull. 1929, 246 (1929).

Panicum canaliculatum Nees in Wight, Cat. 95 (1833), n. 1624, nomen; Steud. Syn. Pl. Glum. 1, 55 (1854); Hook. f., Fl. Brit. Ind. 7, 43 (1896).

P. myurum Wight. ex Steud., loc. cit. 55 nomen.

P. stenostachyum Thw., Enum. Pl. Zeyl. 436 (1864).

Aira interrupta Rottl. ex Steud., loc. cit., nomen.

Distribution: South India and Ceylon, Kenya.

This species has only been collected on a very few occasions and nothing is known of its fodder value.

Exsicc.—Thwaites C.P. 3845, Ceylon.

Hymenachne P. Beauv., Essai Agrost. 48 (1812),
t. 10, fig. 8.

Key to the species of *Hymenachne*

1. Spikelets 4–6.5 mm long; upper glume and lower lemma acuminate
H. pseudointerrupta
1. Spikelets up to 3 mm long; upper glume and lower lemma not acuminate
H. assamica
1. **Hymenachne assamica** (Hook. f.) Hitchc. in Lingnan Sci. J. 7, 222 (1931).
Panicum assamicum Hook. f., Fl. Brit. Ind. 7, 40 (1896).
Distribution: Seems to be confined to Assam. An inhabitant of swamps.
Exsicc.—Type at Kew (Jenkins s.n., Assam).
2. **Hymenachne pseudointerrupta** C. Muell. in Bot. Z. 19, 333 (1861).

Panicum myuros of the Fl. Brit. Ind. 7, 39 (1896) non Lamk. (1791).

Hymenachne amplexicaulis of the Fl. Assam 5, 218 (1940).

Distribution: Assam, Burma, Malaya to Indo-China and Polynesia.

In the *Flora of Assam* 5, 218 (1940) this species appears under the name of *H. amplexicaulis* (Rudge) Nees. A study of the American *H. amplexicaulis* indicates that the South-east Asian species is distinct and should bear C. Mueller's name as above.

This grass is found in swamps, in bheels or on the margins of slow-moving streams. The stems in such places become soft and spongy and the nodes produce numerous feathery rootlets. It is eaten by buffaloes. Exsicc.—N. L. Bor 18004, Assam; Sri Ram s.n., Uttar Pradesh; Herb. Wight. 1651, Madras.

***Ichnananthus* P. Beauv.**, Essai Agrost. 56 (1812),
t. 12, fig. 1.

Key to the species of *Ichnananthus*

1. Leaves broadly elliptic-acute or lanceolate-acute, thin, flat, 5–15 cm long, 1–2.5 cm broad; panicle widely spreading; upper lemma turned through 90° on the stipe *I. vicinus*
1. Leaves narrowly lanceolate-acute, thick, rolled, involute, not more than 5 cm long by 0.8 mm broad; panicle with short erect branches, half immersed in the uppermost leaf-sheath; upper lemma not turned through 90° on the stipe *I. foliolosus*

1. ***Ichnananthus foliolosus* Munro ex Hook. f.**, Fl. Brit. Ind. 7, 61 (1896).
Panicum foliolosum Wall., Cat. n. 8680, nomen nudum.

Distribution: Burma.

Little is known of this species but one collector describes it as a "hilly grass". From its habit one would hazard a guess that it is a xerophytic species.

Exsicc.—Type at Kew (*Wallich* 8680, Burma).

2. ***Ichnananthus vicinus* (F. M. Bail.) Merr.** in Enum. Philipp. Fl. Pl. 1, 70 (1923).

Panicum vicinum F. M. Bail., Syn. Queens. Fl. Suppl. 3, 82 (1890).

Ichnanthus pallens of the Fl. Brit. Ind. 7, 60 (1896) non Munro (1861).

Panicum nitens Merr. in Philipp. Gov. Lab. Bur. Bull. 17, 8 (1904) non K. Schum. (1901).

Distribution: Plains and hills of north-east India ascending to 1500 m. Also found in Malaysia, Polynesia to the Philippines and Queensland in Australia.

A forest grass often found along paths and in clearings, growing gregariously and covering considerable areas. It trails over other vegetation and sends down roots from the nodes. It is readily eaten by cattle. The

ripe fruit seems to turn through 90° on its long axis in the spikelet.
 Exsicc.—*Griffith* 6557, Assam; *Thwaites* C.P. 2755, Ceylon.

Melinis *P. Beauv.*, Essai Agrost. 54 (1812), t. 11, fig. 4.

Suardia Schrank, Pl. Rar. Hort. Acad. Monac. (1819), t. 58.

Tristegis Nees, Hor. Phys. Berol. 47, 54 (1820).

1. **Melinis minutiflora** *P. Beauv.*, Ess. Agrost. 54 (1812), t. 11, f.4.
Suardia picta Schrank, Pl. Rar. Hort. Acad. Monac. (1819), t. 58.
Tristegis glutinosa Nees, Hor. Phys. Berol. 47, 54 (1820).
Panicum minutiflorum (*P. Beauv.*) Raspail in Ann. Sci. Nat. Bot. 5, 299 (1825).
P. melinis Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 3, 291 (1834).
Muehlenbergia brasiliensis Steud., Syn. Pl. Glum. 1, 177 (1854).

Distribution: A native of Africa but now introduced into many tropical countries as a fodder grass.

This grass has a characteristic odour, and moreover the leaves and sheaths are covered with hairs which secrete a viscous oil with the odour of cumin. The viscous nature of the species makes it unpleasant to the touch and the odour is also repugnant to some people. On the other hand, while stock are somewhat shy of the species at first they can overcome their dislike and then eat the grass with avidity. In Angola it forms a most excellent pasture and is said to be the only grass to retain its greenness in dry, open, exposed situations.

In the Belgian Congo the natives are well aware of its insect-repellent qualities, and it is also considered to be insecticidal. It is used to make beds for sitting fowls and also for dogs about to give birth to young. In Manipur mosquitoes avoid it, possibly both the odour and viscid hairs being repellent. There is no doubt that it is a very valuable introduction.
 $2n = 36$ (Avdulov).

Oplismenus *P. Beauv.*, Fl. Oware et Benin 2, 14 (1807), t. 58.

Orthopogon R.Br., Prodr. Fl. Nov. Holl. 194 (1810).

Hoplismenus Hassk., Cat. Pl. Hort. Bogor. 16 (1844).

Key to the species of *Oplismenus*

1. Awns longer than the glumes:—
 2. Inflorescence of racemes of spikelets alternate along a long or short rachis:—
 3. Awns reddish, smooth, viscid, filiform, stiff *O. compositus*
 3. Awns pale, barbellate, capillary, often flexuous *O. burmannii*
 2. Inflorescence of groups of fascicled spikelets alternate along the axis
 - O. undulatifolius*
 - O. thwaitesii*
1. Awn shorter than the glume

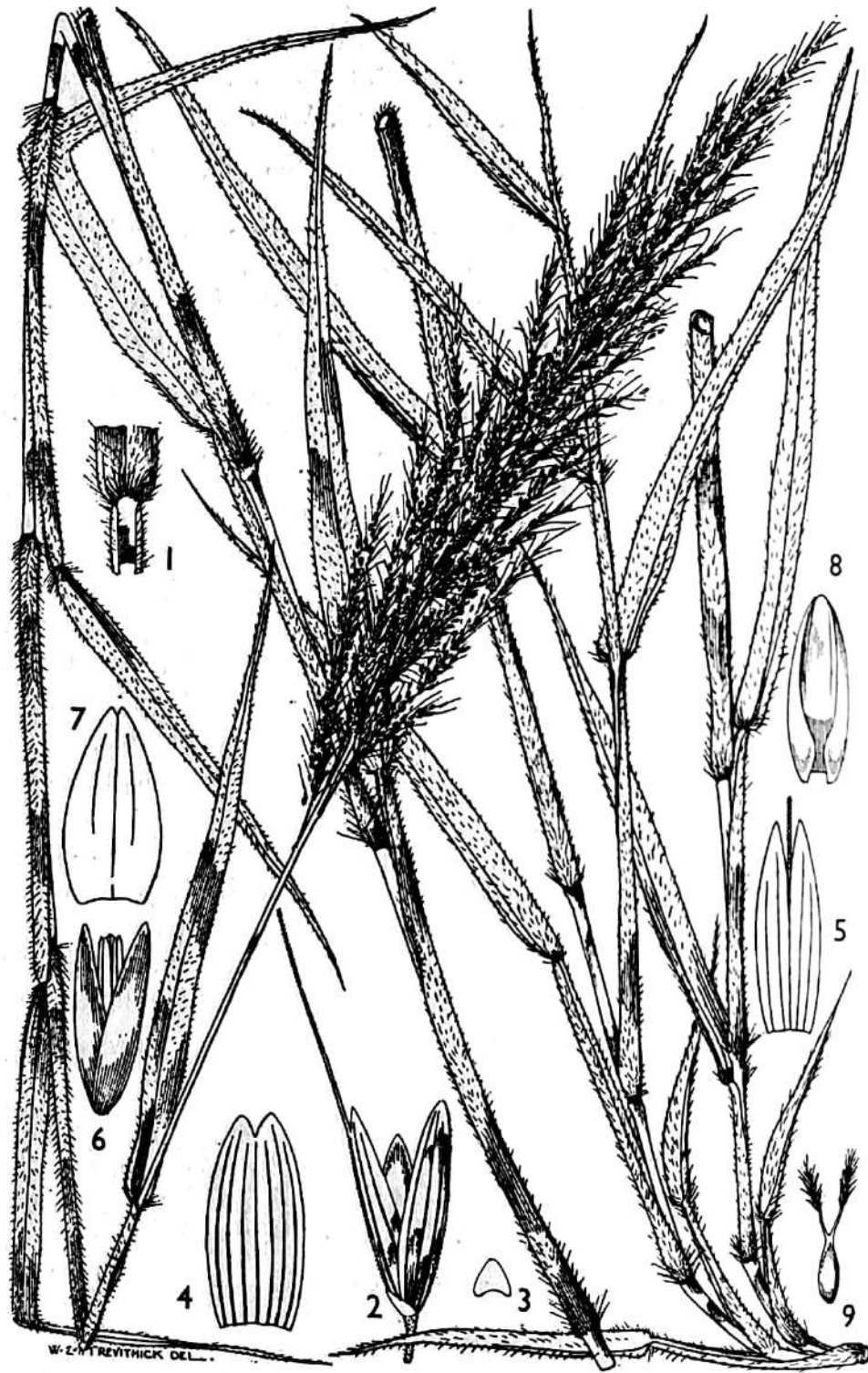


Fig. 35. *Melinis minutiflora* P. Beauv.

Plant $\times \frac{1}{4}$. 1, ligule; 2, spikelet; 3, lower glume; 4, upper glume; 5, lemma of lower floret; 6, upper floret; 7, lemma; 8, palea; 9, ovary, styles and stigmas; all $\times 4$.

✓ 1. **Oplismenus burmannii** (Retz.) P. Beauv., Ess. Agrost. 54, 168, 169 (1812).

Panicum hirtellum Burm., Fl. Ind. 24 (1768), t. 12, fig. 1, non Linn. (1753).

P. burmannii Retz., Obs. Bot. 3, 10 (1783).

P. bromoides Lamk., Tab. Encycl. Meth. Bot. 1, 170 (1791).

Oplismenus bromoides (Lamk.) P. Beauv., Ess. Agrost. 168, 169 (1812).

Panicum album Poir. ex Lamk., Encycl. Meth. Bot. Suppl. 4, 274 (1816).

Oplismenus humboldtianus Nees, Agrost. Bras. 264 (1829).

O. cristatus J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 323 (1830).

O. affinis J. S. Presl, loc. cit. 323.

O. preslii Kunth, Enum. Pl. 1, 141 (1833).

Panicum japonicum Steud. in Flora 29, 18 (1846).

Oplismenus multisetus A. Rich., Tent. Fl. Abyss. 2, 377 (1851).

Panicum multisetum Hochst. ex A. Rich. loc. cit. 377.

Orthopogon albus Nees ex Steud., Syn. Pl. Glum. 1, 44 (1854).

Oplismenus indicus Duthie, List Grass. N.W. Ind. 8 (1888) non Roem. et Schult. (1817).

Distribution: Widespread in the tropics of both hemispheres.

This species often forms pure mats in the shade of trees on grazing land and in open spaces. A form with singularly pale spikelets was described as var. *albidulum* N.E. Br. in the *Gardeners' Chronicle* 26, 776 (1886). $2n = 72$ (Hunter).

Exsicc.—C. B. Clarke 36709, Sikkim; C. E. Parkinson 15192, Burma; Nusker 1179, Bengal.

✓ 2. **Oplismenus compositus** (Linn.) P. Beauv., Ess. Agrost. 54, 168, 169 (1812).

Panicum compositum Linn., Sp. Pl. ed. 1, 57 (1753).

P. aristatum Retz., Obs. Bot. 4, 17 (1786).

P. lanceolatum Retz., Obs. Bot. 5, 17 (1789).

P. sylvaticum Lamk., Encycl. Meth. Bot. 4, 733 (1796).

Andropogon undatus Jacq., Coll. 3, 237 (1789).

Orthopogon compositus (Linn.) R.Br., Prodr. 194 (1810).

Oplismenus elatior P. Beauv., Ess. Agrost. 54, 168 (1812).

Echinochloa lanceolata (Retz.) Roem. et Schult., Syst. Veg. 2, 476 (1817).

Oplismenus sylvaticus Roem. et Schult., Syst. Veg. 2, 481 (1817). 1817

Orthopogon remotus Trin., Fund. Agrost. 181 (1820).

O. pratensis Spreng., Syst. Veg. 1, 306 (1825).

Oplismenus pratensis Schult., Syst. Veg. 2, Mant. 597 (1827).

O. jacquinii Kunth, Rév. Gram. 1, 44 (1829).

O. lanceolatus (Retz.) Kunth, loc. cit. 45.

Panicum peninsulanum Steud., Syn. Pl. Glum. 1, 44 (1854).

P. certificandum Steud., loc. cit. 44.

P. longeracemosum Steud., loc. cit. 45.

P. undatum Steud., loc. cit. 45.

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P. bidentulum Steud., loc. cit. 45.

Orthopogon junghuhnii Miq., Fl. Ind. Bat. 3, 444 (1857).

O. longeracemosus Miq., loc. cit. 443.

O. sylvaticus Miq., loc. cit. 443.

Oplismenus africanus Wood, Natal Pl. (1908), t. 165, non P. Beauv. (1812).

O. decompositus Nees in Endl., Prodr. Fl. Norfolk. 19 (1833).

Distribution: Tropical regions of the Old and New Worlds.

This species is a true forest grass and appears in gregarious patches along forest paths as well as in glades and in open shady places. The awns are sticky and the ripe spikelets become attached to passing animals and humans, thereby distributing the seed. $2n = 72$ (Avdulov).
Exsicc.—Bourne 3001, Madras; A. A. Bullock 609, Manipur; Thwaites C.P. 3963, Ceylon.

3. *Oplismenus thwaitesii* Hook. f. in Trim., Fl. Ceyl. 5, 169 (1900).

Distribution: Ceylon.

This species is based on one gathering only. It looks different but may be only a variant of *O. burmannii*.

Exsicc.—Type at Kew (Thwaites C.P. 3964, Ceylon).

4. *Oplismenus undulatifolius* (Ard.) P. Beauv., Ess. Agrost. 54 (1812).

Panicum undulatifolium Ard., Animad. Spec. Alt. 14 (1764), t. 4.

Orthopogon undulatifolius Spreng., Syst. Veg. 1, 306 (1825).

Distribution: Southern Europe eastwards through the warm temperate parts of Asia.

This species is sometimes considered to be a variety of *O. compositus* but, as Hooker remarks, it keeps its characters of the inflorescence throughout its distribution and, moreover, it has a different chromosome number and may hence be regarded as distinct. It is a forest grass and the awns are viscid as in *O. compositus*. $2n = 54$ (Avdulov).

Exsicc.—R. R. Stewart 12513, Punjab; J. F. Duthie 5030 Garhwal; Thwaites C.P. 3683, Ceylon.

Ottochloa Dandy in J. Bot. 69, 54 (1931).

Hemigymnia Stapf in Prain, Fl. Trop. Afr. 9, 741 (1920) non Griff. (1843).

1. *Ottochloa nodosa* (Kunth) Dandy in J. Bot. 69, 55 (1931).

Panicum multinode J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 303 (1830) non *P. multinode* Lamk. (1798).

P. nodosum Kunth, Enum. Pl. 1, 97 (1833).

P. arnottianum Nees ex Steud., Syn. Pl. Glum. 1, 59 (1854).

Hemigymnia multinodis Stapf in Prain, Fl. Trop. Afr. 9, 742 (1920) in obs.

Distribution: Plains and hills up to 600 m in north-east and south India, Ceylon, Burma, extending to Malaysia and the Philippines.

This grass, usually found along the forest margins, can also exist as a true forest grass. It is probably eaten by stock and game.

Exsicc.—*N. L. Bor* 18415, Assam; *Wenger* 259, Lushai Hills; *U Thein Lwin* 112, Burma.

Panicum Linn., Gen. Pl. ed. 5, 29 (1754) et in
Sp. Pl. ed. 1, 55 (1753).

Key to the species of *Panicum*

1. Leaf-blades linear to narrowly lanceolate; spikelets symmetrical:—
 2. Lemma of the upper floret finely transversely rugose; nerves of the upper glume and lower lemma obscure; glumes and lower lemma sometimes hairy *P. maximum*
 2. Lemma of the upper floret quite smooth; nerves of upper glume and lower lemma definite, conspicuous:—
 3. Spikelets 4–5 mm long, sharply acute, ovate to elliptic in back view:—
 4. Leaf-sheaths hairy; spikelets persistent; lower glume acuminate, three-quarters the length of the spikelet *P. miliaceum*
 4. Leaf-sheaths glabrous; spikelets deciduous:—
 5. Panicle very large up to 30 cm long by 15 cm wide; lower whorled branches up to 20 cm long and enclosed in mouth of topmost sheath; spikelets distant, 4 mm long; tips of glumes and lower lemma very acute, acuminate or much compressed; lower glume as long as the spikelet *P. hippothrix*
 5. Above characters not present together:—
 6. Lower glume almost as long as the spikelet; spikelets very turgid at maturity; a shrubby species with a woody rootstock *P. turgidum*
 6. Lower glume shorter than the spikelet:—
 7. Lower glume less than half the length of the spikelet, ovate-mucronulate; spikelets gaping; leaves subradical, long, narrow, softly hairy; spikelets 4 mm long *P. elegantissimum*
 7. Lower glume as long as half the length of the spikelet or longer; spikelets not gaping; leaves glabrous, mainly on the stem:—
 8. Leaves ovate-lanceolate to broadly lanceolate, rounded at the base; glumes silvery hyaline on the margins *P. gardneri*
 8. Leaves linear-lanceolate, narrowed at the base:—
 9. Ligules a dense row of hairs; rhachilla produced beyond the upper floret as a membranous apiculate scale *P. fischeri*
 9. Ligule membranous; rhachilla not produced beyond the upper floret *P. incisum*

3. Spikelets up to 3.5 mm long, rarely up to 4 mm, and if so, with narrow lanceolate spikelets:—

10. Spikelets about 1.5 mm long:—

11. Dwarf grass; spikelets 1.5 mm long; leaves narrow from a narrow base; upper glume 3-nerved; lower floret paleate

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walense *P. austroasiaticum*

11. Tall slender grass; spikelets 1–1.5 mm long; leaves linear from a narrow cordate base; upper glume 5-nerved; lower floret epaleate *P. humidorum*

10. Spikelets over 1.5 mm long:—

12. Lower glume cuspidate or cuspidate-acuminate:—

13. Spikelets 1.5–3 mm long:—

14. Lower glume cuspidate; spikelets slightly compressed and glabrous, 1.5–1.75 mm long *P. sparsicomum*

14. Lower glume cuspidate-acuminate; spikelets not compressed nor gibbous, about 3 mm long, gaping widely at anthesis *P. trypheron*

13. Spikelets 3.5 mm long or over *P. virgatum*

12. Lower glumes not cuspidate-acuminate and spikelets not gaping:—

15. Spikelets narrowly lanceolate to lanceolate-oblong, acute:—

16. Lower glume orbicular, rotundate or truncate, one-sixth to one-fourth the length of the spikelet; spikelets 2.5–4 mm long; panicle-branches loosely to closely spiculate:—

17. Spikelets 3 mm long, narrowly lanceolate; leaf-blades broad, flat, green; culms spongy, floating; lower glume orbicular in outline, almost cup-shaped in the spikelet *P. paludosum*

17. Spikelets lanceolate to lanceolate-oblong; leaf-blades narrow, often involute, glaucous; culms tough, rhizomatous; lower glume as above *P. repens*

16. Lower glume ovate, acute or obtuse, one-third the length of the spikelet; spikelets 2–2.25 mm long; panicle-branches densely spiculate *P. auritum*

15. Spikelets oblong, ovate-oblong to elliptic, acute or obtuse:—

18. Lower glume one-quarter to half the length of the spikelet:—

19. Lower glume cuspidate or cuspidate-acuminate; spikelets 1.5–1.7 mm long, slightly compressed, gibbous *P. sparsicomum*

19. Lower glume and spikelets not as above:—

20. Nodes and leaf-sheaths hairy:—

21. Spikelets persistent

P. miliaceum

21. Spikelets deciduous:—

- 22. Annual; nerves anastomosing in glumes
P. cambogiense
- 22. Perennial; nerves not anastomosing
P. khasianum
- 20. Nodes and leaf-sheaths glabrous:—
 - 23. Annuals; culms erect or geniculate; leaf-blades linear; lower floret paleate; sheaths sometimes hairy:—
 - 24. Spikelets persistent, 2–3.5 mm long; panicle contracted, 4–15 cm long; lower glume orbicular, apiculate
P. miliare
 - 24. Spikelets deciduous, 2–3 mm long; panicle effuse, often diseased, and the spikelets giant and deformed; lower glume ovate-apiculate
P. psilopodium
 - 23. Perennials:—
 - 25. Spikelets acute or acuminate:—
 - 26. Rootstock villous-hairy, stout, creeping, sending out hairy extravaginal stolons in all directions; spikelets crowded, very rarely spaced; spikelets often suffused with purple; lower floret neuter
P. antidotale
 - 26. Rootstock absent; roots wiry and fibrous; spikelets well spaced; stolons, if any, intravaginal; lower floret male
P. coloratum
 - 25. Spikelets obtuse or subacute; lower glume not broadly scarious, about one-quarter the length of the spikelet; leaves broadly lanceolate, up to 35 mm broad, slightly cordate at the base; lower floret epaleate; spikelets widely spaced; stem prostrate and creeping below, rooting at the nodes
P. khasianum
- 18. Lower glume one-half to three-quarters the length of the spikelet or more:—
 - 27. Spikelets obtuse, 2–2.5 mm long; leaf-blades broad, perennials:—
 - 28. Leaf-margins usually, but not always, pectinately ciliate below; lower floret epaleate; panicle effuse; leaf-base deeply cordate; ligule obscure
P. montanum
 - 28. Leaf-margins not pectinately ciliate; lower floret paleate; leaf-base not cordate, rounded, narrow:—
 - 29. Inflorescence globular or ellipsoidal; spikelets often very crowded; glumes and lemmas dull, matt, with strongly marked nerves; branches

- and branchlets viscid; lower glume three-quarters the length of the spikelet *P. incomtum*
29. Inflorescence usually panduriform or fan-shaped; spikelets not crowded; glumes and lemmas shining, not strongly nerved; branches and branchlets smooth; lower glume half the length of the spikelet *P. sarmentosum*
27. Spikelets acute, 1.75–3 mm long; annual or perennial:—
30. Perennials; upper lemma white or cream; plants glabrous:—
31. Lower floret paleate; panicle not effuse; spikelets often crowded on the branches, 2.5–3 mm long; rootstock stout, creeping, with villously sheathed stolons; culms branching; glumes with broad membranous margins *P. antidotale*
31. Lower floret epaleate; panicle lax; spikelets few in number, spaced, 2 mm long, glabrous or sparsely puberulous *P. bisulcatum*
30. Annuals:—
32. Lower glume one-half to two-thirds as long as the spikelet; fruit brown to purple-black; a low, often dwarf, grass; culms and leaves hairy *P. atosanguineum*
32. Lower glume less than half as long as the spikelet; fruit whitish to yellowish; culms and leaves glabrous *P. laevifolium*
1. Leaves ovate-acuminate, amplexicaul; spikelets somewhat gibbous *P. brevifolium*

✓ 1. ***Panicum antidotale* Retz.**, Obs. Bot. 4, 17 (1786).

Distribution: Madras, north-western India, Afghanistan and Persia westward.

This species is often found on sand dunes, in the dry beds of rivers and in desert places generally, where its extensive rooting system, often extending for many yards, ensures its survival in times of drought. In more favourable habitats it grows very luxuriantly. It is an excellent sand-binder but its fodder value is very dubious; presumably it is acceptable in the desert where little else is to be found. It is sometimes (fide Blatter) used in native medicine, a circumstance from which it doubtless receives its specific name. $2n = 18$ (Burton).

Exsicc.—J. R. Drummond 21144, Punjab; Herb. Wight. 1628, Madras.

✗ 2. ***Panicum atosanguineum* Hochst. ex A. Rich.**, Tent. Fl. Abyss. 2, 375 (1851).

P. hydaspicum Edgew. in J. Linn. Soc. (Bot.) 6, 207 (1862).

✓ *Panicum deccanensis* Nakf & Patankar.

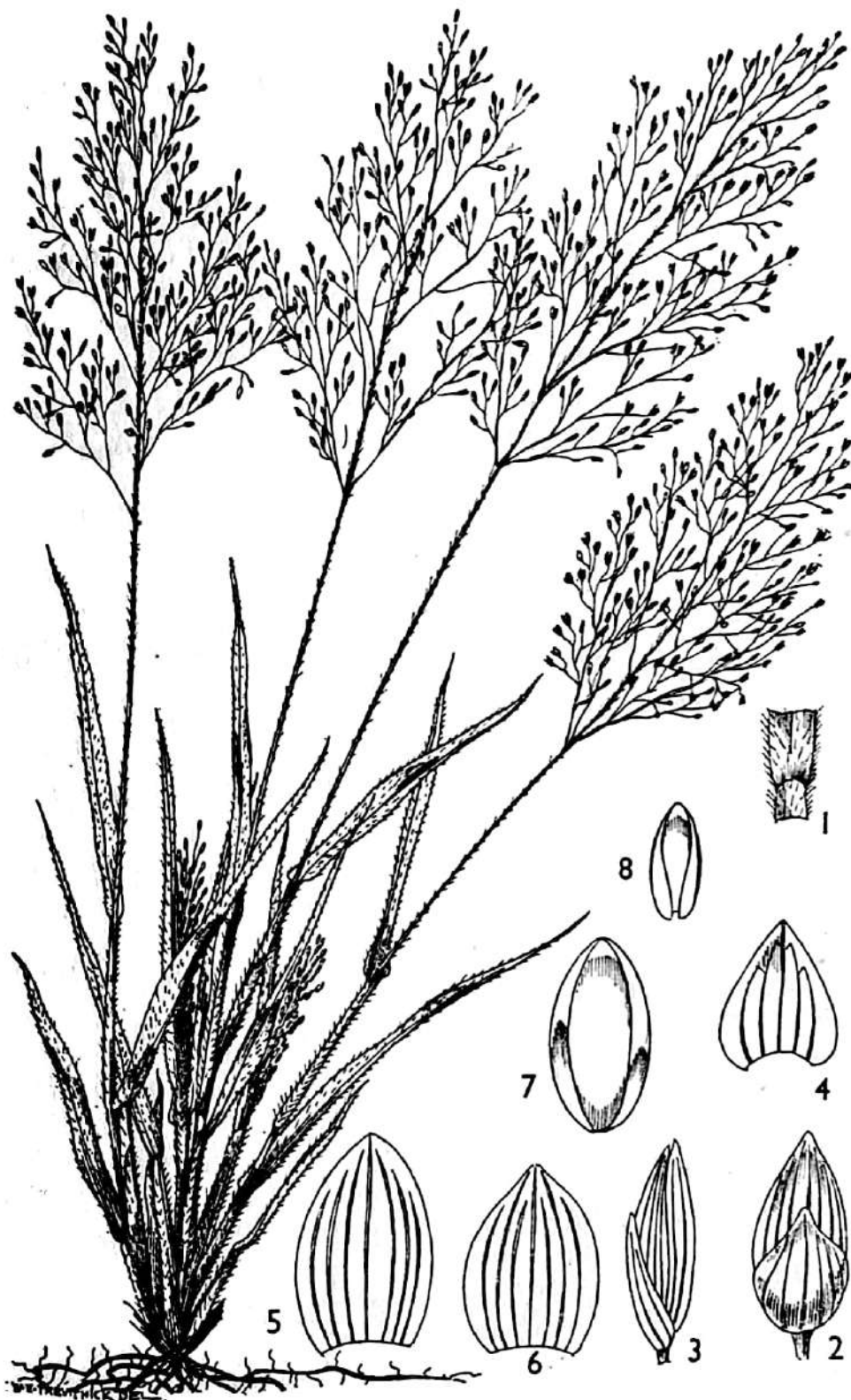


Fig. 36. *Panicum atrosanguineum* Hochst. ex A. Rich.
 Plant $\times \frac{1}{4}$. 1, ligule; 2 and 3, front and side view of spikelets; 4, lower glume;
 5, upper glume; 6, lemma of lower floret; 8, palea; 7, upper floret; all $\times 12$.



Fig. 37. *Panicum maximum* Jacq.
 Plant $\times \frac{1}{4}$. 1, ligule; 2, spikelet; 3, lower glume; 4, upper glume; 5, back view
 of upper lemma; 6, flower; all $\times 4$.

Distribution: North Mexico.

The upper lemma of this species is obscurely rugose and it should not be difficult to determine. The only other species with which it could be confused is *P. maximum*, from which it can be separated by its glabrous nodes and shorter ligules (2 mm).

***Panicum stapfianum* Fourc.** in Trans. Roy. Soc. Afr. 21, 76 (1932).

P. minus Stapf in Dyer, Fl. Cap. 7, 410 (1899) non Nash (1895).

Distribution: South Africa.

The species is said to be easily confused with *P. coloratum* Linn. and apparently the only difference between the two is the habit. *P. stapfianum* has straight stems and is a tufted plant. *P. coloratum* Linn. is not tufted and the culms are not straight.

***Panicum capillare* Linn. var. *occidentale* Rydb.** in U.S. Nat. Herb. Contrib. 3, 186 (1895).

P. barbipulvinatum Nash in Rydb., N.Y. Bot. Gard. Mem. 1, 21 (1900).

Leptoloma barbipulvinata (Nash) Smyth in Trans. Kans. Acad. Sci. 25, 86 (1913).

Milium barbipulvinatum (Nash) Lunell in Amer. Midl. Nat. 4, 212 (1915).

P. capillare Linn. is a species of the southern U.S.A. and is often found as a weed in cultivated ground. The variety, *occidentale*, has larger spikelets than the type (2.5–3.3 mm as against 2–2.5 mm). It has recently been collected in Baluchistan in conditions which suggest that it has been accidentally introduced and escaped. It belongs to that class of plants known as “tumble weeds”, in which the whole inflorescence breaks off and is blown away by the wind, scattering its seed as it rolls along. It keys down to “no. 20-nodes and leaf-sheaths hairy”, but differs from the three species, *P. miliaceum*, *P. cambogiense* and *P. khasianum*, by the pointed tips to the upper glume and lower lemma, and the yellowish or olive-brown fruit which is articulated to the rhachilla and falls independently of the glumes.

Exsicc.—*Helen Crookshank* 426, Ziarat: grows in clumps on dampish ground.

***Paspalidium* Stapf** in Prain, Fl. Trop. Afr. 9, 582 (1920).

Key to the species of *Paspalidium*

1. Spikes shorter than the internodes; annual; rhachis produced; upper glume not as long as upper lemma, only half as long or a little longer; upper lemma granular not rugulose *P. flavidum*
1. Spikes longer than the internodes:—
 2. Perennial; rhachis of the spikes produced into a sharp point; upper glume half length of upper lemma or more; upper lemma rugulose *P. punctatum*

2. Annual; rhachis of the spikes not produced into a sharp point; upper glume nearly as long as the upper lemma; upper lemma granular, smooth and shining; in marshes, often floating *P. geminatum*

✓ 1. ***Paspalidium flavidum* (Retz.) A. Camus** in Lecomte, Fl. Gén. de l'Indo-Chine 7, 419 (1922).

Panicum flavidum Retz., Obs. Bot. 4, 15 (1786).

P. floridum Royle, Ill. Bot. Himal. 420 (1840).

P. granulare Lamk., Tab. Encycl. Meth. Bot. 1, 170 (1791).

Distribution: Tropical Asia.

Found in damp hollows and ditches in the moister parts of the plains and hills of India, up to 1500 m.

Exsicc.—R. R. Stewart 10171, Rawalpindi; N. L. Bor 18486, Sikkim; U Thein Lwin 30, Burma; Herb. Wight. 1613, Madras.

✓ 2. ***Paspalidium geminatum* (Forssk.) Stapf** in Prain, Fl. Trop. Afr. 9, 583 (1920).

Panicum geminatum Forssk., Fl. Aegypt.-Arab. 18 (1775).

P. fluitans Retz., Obs. Bot. 3, 8 (1783).

Paspalum appressum Lamk., Tab. Encycl. Meth. Bot. 1, 176 (1791).

Digitaria appressa (Lamk.) Pers. Syn. 1, 85 (1805).

Panicum paspaloides Pers. Syn. 1, 81 (1805).

Digitaria affinis Roem. et Schult., Syst. Veg. 2, 470 (1817).

Panicum beckmanniaeforme Mikan ex Trin. in Spreng., Neue Entdeck. 2, 83 (1821).

P. truncatum Trin., Gram. Panic. 130 (1826).

P. affine (Roem. et Schult.) Nees, Agrost. Bras. 113 (1829).

P. brizaeforme J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 302 (1830).

P. appressum (Lamk.) Doell in Mart., Fl. Bras. 2, 184 (1877).

Distribution: Tropical Africa and Asia.

Usually found in very wet places, swamps, bheels and the like, where the lower stems are often 1 cm or more in diameter. The succulent stems and leaves are much sought after by buffaloes and cattle.

Exsicc.—J. F. Duthie 6529, Bundelkhand; Herb. Wight., Madras; Thwaites C.P. 897, Ceylon.

3. ***Paspalidium punctatum* (Burm.) A. Camus** in Lecomte, Fl. Gén. de l'Indo-Chine 7, 419 (1922).

Panicum punctatum Burm., Fl. Ind. 26 (1768).

P. mucronatum Roth ex Roem. et Schult., Syst. Veg. 2, 425 (1817).

Distribution: Tropical Asia.

Found in wet places, in ponds, bheels and along the margins of streams where the basal internodes often reach a considerable thickness. Much relished by all stock.

Exsicc.—Royle s.n., West Himalaya; Wallich 8691, Madras.

Paspalum Linn. Syst. Nat. ed. 10, 855 (1759).

Ceresia Pers., Syn. Pl. 1, 85 (1805).

Paspalanthium Desv., Opusc. 59 (1831).

Moenchia Wender. in Steud., Nom. Bot. ed. 2, 2,
153 (1841) nomen.

Anachyris Nees in Journ. Bot. Kew Misc. 2, 103 (1850).

Key to the species and varieties of *Paspalum*

1. Spikelets arranged in four rows upon a broad rhachis:—
 2. Rhachis up to 4 mm broad *P. longifolium* var. *longifolium*
 2. Rhachis 4–8 mm broad *P. longifolium* var. *lorirhachis*
1. Spikelets in two rows:—
 3. Spikelets very small, up to 1.25 mm long:—
 4. Margins of the upper glume glabrous *P. compactum* var. *compactum*
 4. Margins of the upper glume fimbriate *P. compactum* var. *fimbriatum*
 3. Spikelets much larger or if less than 2 mm long, then ciliate on the margins:—
 5. Spikelets fringed with fine white hairs from the margins of the upper glume:—
 6. Perennial with long creeping stolons; spikelets 1.4–2 mm long, yellowish-green; racemes usually two *P. conjugatum*
 6. Perennials, tufted; spikelets 2–4 mm long, dull green or purplish; racemes more than two:—
 7. Racemes 3–5; spikelets 2.8–4 mm long; culms usually geniculate at the base *P. dilatatum*
 7. Racemes usually 10–18; spikelets 2–3 mm long; culms erect *P. urvillei*
 5. Spikelets glabrous or pubescent, not ciliate on the margins:—
 8. Spikelets broadly elliptic to ovate-elliptic, acute, 2.5–4.5 mm long; perennial, aquatic grasses with rhizomes and long creeping stolons:—
 9. Upper glume covered with a very short pubescence; lower lemma with a prominent middle nerve; racemes often long, up to 9 cm long; lower glume either absent or a truncate or subulate scale; an erect grass; spikelets elliptic, twice as long as broad; plant geniculate *paspaloides P. distichum*
 9. Upper glume entirely glabrous; middle nerve of the lower lemma faint; racemes short, not above 4 cm long; lower glume absent; a grass with prostrate stems rooting at the nodes; spikelets broadly lanceolate, three times as long as broad *distichum P. vaginatum*
 8. Spikelets rotundate-elliptic, broadly obovate-elliptic to almost

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orbicular, obtuse:—

10. Lower lemma chartaceous or cartilaginous, smooth, shining, or some of the lemmas chartaceous, some cartilaginous, or even half the lemmas chartaceous and the other half cartilaginous (Reeder) *P. cartilagineum*

10. Lower lemma membranous:—

11. Annuals:—

12. Spikelets 2.2–3 mm long, definitely obovate in outline; lower lemma 5-nerved *P. convexum*

12. Spikelets up to 2.5 mm long, orbicular or ovate-orbicular; lower lemma 7-nerved *P. scrobiculatum*

11. Perennials:—

13. Spikelets obovate-elliptic, elliptic or ovate, 3–3.5 mm long; racemes two only; rhizomes short, stout, woody *P. notatum*

13. Spikelets shorter, 1.8–2.8 mm long; racemes often more than 2:—

14. Lower lemma with short transverse wrinkles just inside the slightly raised margin; spikelet deep brown or dark olivaceous at maturity *P. plicatulum*

14. Lower lemmas not so wrinkled, not turning deep brown:—

15. Spikelets 2-ranked, rotundate-elliptic, 2–2.8 mm long; upper glume and lower lemma 5–7-nerved *P. commersonii*

15. Spikelets ovate-elliptic or orbicular, in two rows, 1.8–2.2 mm long; lower lemma 3-nerved but side nerves often double *P. orbiculare*

1. *Paspalum cartilagineum* J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 216 (1830).

Distribution: South-east Asia, Polynesia. In India it has been collected in Bengal, Chota-Nagpur and in Ceylon.

I am keeping this grass as a good species since I, personally, have found that the indurated lower lemma is a good character in the Indian specimens. Reeder in J. Arn. Arb. 29, 299 (1948) says he has found this character of the indurated lemmas to be unreliable in that it may be present or absent on the same plant. It may be that such plants are hybrids. At any rate, this species would seem to be one to which the methods of experimental taxonomy could be applied.

Exsicc.—J. S. Gamble 8956, Chota Nagpur.

✓ 2. *Paspalum commersonii* Lamk., Tab. Encycl. Meth. Bot. 1, 175 (1791), t. 43, f.1.

P. scrobiculatum Linn. var. *commersonii* (Lamk.) Stapf in Prain, Fl. Trop. Afr. 9, 573 (1919).

P. scrobiculatum Bojer, Hort. Maur. 361 (1837) partim.



Fig. 38. *Paspalum commersonii* Lamk.
 Plant $\times \frac{1}{4}$; 1, ligule; 2, apical portion of a raceme showing 2a, very short pedicels and 2b, winged axis; 3, winged axis from above $\times 3$; 4, upper glume; 5, lower lemma; 6, upper lemma; 7, palea; 8, grain; all $\times 6$.

13. *Paspalum urvillei* Steud., Syn. Pl. Glum. 1, 24 (1854).
P. ovatum var. *parviflorum* Nees, Agrost. Bras., 43 (1829).
P. velutinum Trin. ex Nees, Agrost. Bras. 43 (1829) as synonym of above.
P. dilatatum var. *parviflorum* Doell in Mart., Fl. Bras. 2, 64 (1877).
P. larranagai Arech., Ann. Mus. Nac. Montevideo 1, 60 (1894), t. 2.
 Distribution: Native to Uruguay and Argentina, but now introduced into many countries, including India, and considered to be a very valuable pasture grass for dairy cattle, though it is much coarser than *P. dilatatum*, which it resembles in appearance. Unfortunately it becomes very coarse and somewhat unpalatable with age. $2n = 40, 60$ (Nielsen).
 Exsicc.—Beck 602, Ceylon.

- ✓14. *Paspalum vaginatum* ^{distichum L.} Swartz, Prodr. Veg. Ind. Occ. 21 (1788). *see dolobunda* 1973
Digitaria foliosa Lag., Gen. et Sp. Nov. 4 (1816).
Paspalum brachiatum Trin. ex Nees, Agrost. Bras. 62 (1829).
P. foliosum Kunth, Rév. Gram. 1, 25 (1829).
P. inflatum A. Rich. in Sagra, Hist. Cuba 11, 298 (1850).
P. distichum var. *vaginatum* (Swartz) Griseb., Fl. Brit. W. Ind. 541 (1864).
Sanguinaria vaginata (Sw.) Bubani, Fl. Pyren. 4, 258 (1901).
 Distribution: Tropics and subtropics of the world.

This species with its system of widely creeping rhizomes and stolons is of the utmost importance on the low sandy coasts of India, where it acts as a most efficient sand-binder. It forms a turf in places and is considered to be a good fodder grass. $2n = 20$.

Exsicc.—A. H. G. Alston 2349, Ceylon.

- Pennisetum** Rich. in Pers., Syn. Pl. 1, 72 (1805).
Penicillaria Willd., Enum. Pl. Hort. Berol. 1036 (1809).
Gymnothrix (*Gymnotrix*) P. Beauv., Ess. Agrost. 59 (1812), t. 13, fig. 6.
Catatherophora Steud. in Flora 12, 465 (1829).
Pentastachya Hochst. ex Steud. Nom. Bot., ed. 2, 2, 299 (1841).
Sericura Hassk. in Flora 25 (1842), 2 Bd., Beibl. 1, 2.
Macrochaeta Steud. in Zoll., Syst. Verz. Ind. Arch. 60 (1854).
Amphochaeta Anderss. in Vet. Akad. Handl. Stockh. 74, 136 (1853).
Beckeropsis Fig. et de Not. in Mem. Acc. Torino, sér. 2, 14, 365 (1854).

Key to the species of *Pennisetum*

1. Lemmas more or less alike; lower not 3-lobed; upper floret not deciduous; rhachis ribbed but not conspicuously so; ribs not winged:—
2. A low, copiously branched perennial forming mats, with numerous stolons with short internodes; culms very short; flowers not usually seen in India, though styles usually exerted *P. clandestinum*

2. Habit not as above; erect annuals or perennials with a well-developed inflorescence:—
3. Anther-cells bearded at the apex:—
 4. Wild grass, perennial; spikelets solitary, not gaping; bristles 10–18 mm long *P. purpureum*
 4. Cultivated grass, annual; spikelets crowded, gaping and exposing the grain; bristles not more than 7 mm long *P. typhoides*
3. Anther-cells not bearded at the apex:—
 5. Rhachis of the spikes villous or woolly:—
 6. Tip of the peduncle hairy; spikelets 6 mm long, solitary, rhachis straight:—
 7. Involucral bristles golden or purple, 10–30 mm long:—
 8. Involucral bristles golden, longest 10–18 mm long; spikelets sessile, spreading at right angles to the rhachis *P. purpureum*
 8. Involucral bristles purple, longest 20–30 mm long; spikelets long-pedicellate, usually ascending *P. alopecuroides*
 7. Involucral bristles green, 5–6 mm long *P. lanatum*
 6. Tip of the peduncle usually glabrous or very slightly puberulous; spikelets 4 mm long, 2 or more in an involucl, occasionally solitary; rhachis \pm flexuous; inner bristles ciliate *P. orientale*
5. Rhachis of the spikes glabrous, often scabrid:—
 9. Bristles of the involucl branched, ciliate *P. lanatum*
 9. Bristles unbranched, often branched low down in *P. flaccidum* but then bristles not ciliate:—
 10. Spikelets 9–15 mm long; bristles up to 30 mm long, densely ciliate *P. villosum*
 10. Spikelets 4–8.5 mm long, or if 9 mm long and over, bristles not densely ciliate; bristles shorter, usually much shorter:—
 11. Lower glume minute or absent, not more than 1.5 mm long:—
 12. Rhachis grooved or angled, scaberulous or minutely hispid, closely beset with the stumps of the deciduous sessile involucels; bristles connate at the base into a narrow shallow involucre, one or more stouter than the others; lower glume about 1 mm long, the upper as long as the spikelet *P. ramosum*
 12. Rhachis not closely beset with the stumps of the fallen involucels; bristles free to the base and all alike in thickness; upper glume shorter than the spikelet:—
 13. Upper glume about one-third the length of the spikelet, 3–4-nerved, oblong-acute or obtuse; lower lemma as long as the spikelet or shorter, (9)–11–13-nerved, epaleate; upper lemma 5–7-nerved;

bristles scabrid, never ciliate; branching fastigate

P. hohenackeri

13. Upper glume half to two-thirds the length of the spikelet, lanceolate-acuminate or setaceous; lower lemma about length of the spikelet, 5-nerved, paleate, enclosing a male flower; upper lemma 5-nerved; bristles scabrid, sometimes sparingly ciliate; a Himalayan grass *P. flaccidum*

11. Lower glume half to three-quarters the length of the spikelet, at any rate over 1.75 mm long:—

14. A perennial tussock grass; rhachis scaberulous, closely ribbed, densely studded with the minute stumps of the fallen sessile involucels; bristles connate into a shallow involucre; lower glume 1.75–2 mm long, upper as long as the spikelet which is 2.75–5 mm long *P. mezianum*

14. Perennial with a very stout rhizome; rhachis scaberulous, angled, with the stumps of the fallen pedicelled involucels 2–3 mm apart; bristles free to the base; lower glume half to three-quarters as long as the spikelet which is 7–9 mm long *P. divisum*

1. Lemmas heteromorphous; lower often 3-lobed; upper floret readily disarticulating; rhachis with decurrent wings on the ribs below the pedicels:—

15. Spikelets solitary and pedicelled or in groups of 2–5, with one sessile and the others pedicelled; bristles usually very woolly; lower glume at least half the length of the lower lemma *P. pedicellatum*

15. Spikelets sessile, solitary; lower glumes minute or small, rarely, if ever, half as long as the lower lemma:—

16. Bristles densely plumose or at least the inner plumose:—

Annual; culms much branched *P. polystachyon*

Perennial; culms not, or sparingly, branched *P. setosum*

16. Bristles glabrous, scaberulous *P. hordeoides*

- ✓ 1. ***Pennisetum alopecuroides* (Linn.) Spreng.**, Syst. Veg. 1, 303 (1825).

Panicum alopecuroides Linn., Sp. Pl. ed. 1, 55 (1753).

Alopecurus hordeiformis Linn., loc. cit. 60.

Pennisetum compressum R.Br., Prod. 195 (1810).

P. hordeiforme (Linn.) Spreng., loc. cit. 302.

Setaria compressa (R.Br.) Kunth, Rév. Gram. 1, 46 (1829).

Gymnothrix compressa (R.Br.) Brongn., Voy. Coq. Bot. 103 (1831).

Distribution: Burma, through Malaya, Polynesia, China to Australia.

Grows in great tufts in open plains (boggy during the rains), rough pasture and open woodland. The rather coarse stems and leaves probably do not make it an attractive fodder for stock. $2n = 18$.

Exsicc.—*J. H. Lace* 4111, Burma.

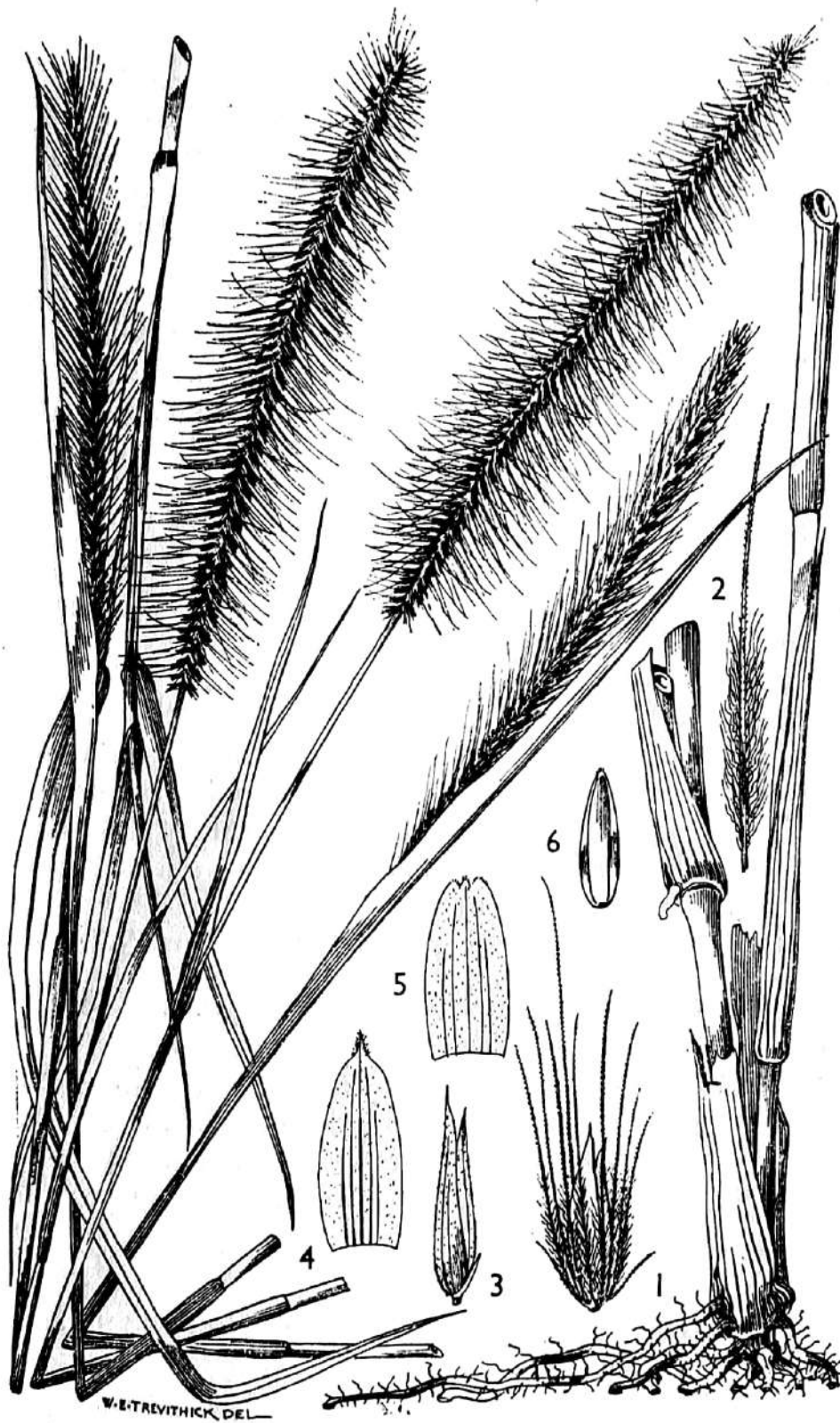


Fig. 39. *Pennisetum polystachyon* (Linn.) Schult.
 Plant $\times \frac{1}{2}$; 1, spikelet, surrounded by bristles; 2, bristle; 3, spikelet with bristles removed; 4, upper glume; 5, lemma of lower floret; 6, upper floret; all $\times 4$.

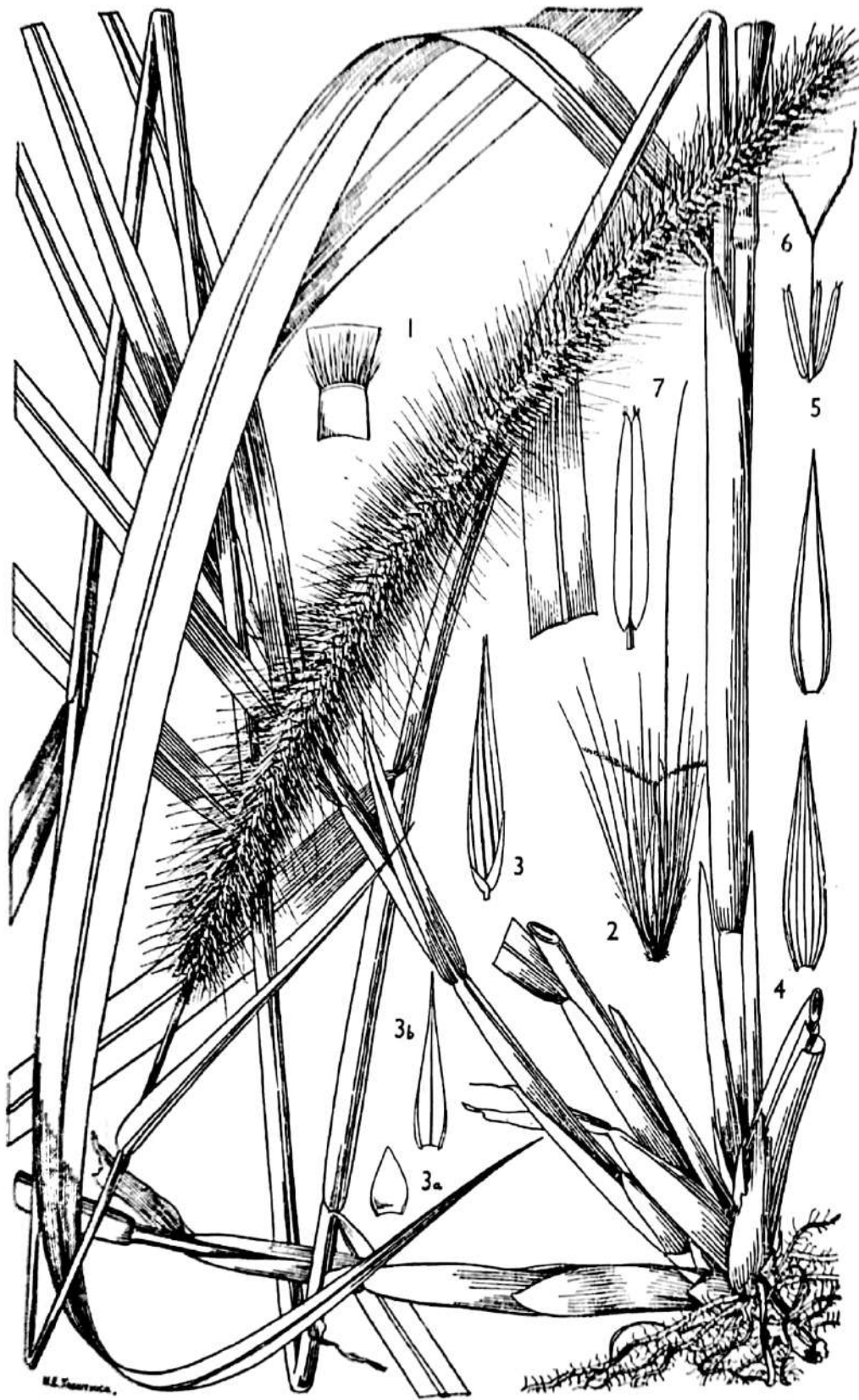


Fig. 40. *Pennisetum purpureum* Schum.
 Plant $\times \frac{1}{2}$; 1, ligule; 2, spikelet and supporting bristles; 3, spikelet, 3a, lower glume, 3b, upper glume; 4, lemma of upper floret; 5, palea; 6, stamens and ovary; 7, stamen, bearded at the tips of the anther cells; 2-5 $\times 3$; 6 $\times 5$; 7 $\times 10$.

Distribution: Native in the Nile-land, in Eritrea and in Arabia.

It is frequently grown as an ornamental grass and escaping from cultivation has become naturalized in many parts of the tropics and subtropics. $2n = 45$ (Krishnaswamy). According to Narayan it is an obligate apomict.

Exsicc.—J. S. Gamble 15300, Madras.

***Pseudechinolaena* (Hook. f.) Stapf** in Prain, Fl. Trop. Afr. 9, 494 (1919).

Panicum Linn. sect. *Pseudechinolaena*
Hook. f., Fl. Brit. Ind. 7, 28 (1896).

1. ***Pseudechinolaena polystachya* (H.B.K.) Stapf** in Prain, Fl. Trop. Afr. 9, 495 (1919).

Echinolaena polystachya H.B.K., Nov. Gen. et Sp. 1, 119 (1816).

Panicum uncinatum Raddi, Agrost. Bras. 41 (1823).

Lappago aliena Spreng., Neue Entdeck. 3, 15 (1822).

Echinolaena trinii Zoll. et Moritz, Syst. Verz. Zoll. 102 (1845–46).

Panicum glandulosum Nees ex Trin. Gram. Panic. 174 (1826).

P. nemorosum Trin., loc. cit. 173.

P. heteranthum Link, Hort. Berol. 1, 212 (1827).

P. echinatum Willd. ex Doell in Mart., Fl. Bras. 2, 2, 193 (1877).

P. polystachyum K. Schum. in Engl., Pflanzenw. Ost-Afr. C, 103 (1895) non al.

Distribution: Hills of Eastern India. Khasi and Naga Hills, Madras State, Ceylon, South-east Asia, tropical regions of both hemispheres.

This is typically a hill forest grass, often forming thick masses in secondary jungle. The legs of grazing animals are often literally covered with the fruits which become attached to the hair by means of the hooked spines on the upper glume.

Exsicc.—Meebold 10466, Madras; N. L. Bor 16264, Naga Hills.

***Pseudoraphis* Griff.**, Notulae 3, 29, 30 (1851).

Chamaeraphis auct. pro parte.

Key to the species and varieties of *Pseudoraphis*

1. Lemma of the lower floret acuminate-aristate; spikelets 4–10 mm long:—
2. Spikelets 4–6 mm long:—
3. Panicle spreading:—
4. Nodes hairy; leaves rough
4. Nodes glabrous; leaves smooth
3. Panicle contracted, *Pennisetum*-like

P. spinescens var. *spinescens*
var. *subglabra*
var. *depauperata*

2. Spikelets 8–10 mm long, 1–3 on each branch of the rhachis
P. brunoniana
 1. Lemma of the lower floret subacute; spikelets 2.5–4 mm long; inflorescence congested
P. minuta

1. ***Pseudoraphis brunoniana*** Griff., Not. 3, 29 (1851).
Panicum brunonianum Griff., Not. 3, 29 (1851).
P. intermedium Griff., loc. cit. 29.
Holcus natans Roxb. ex Hook. f., Fl. Brit. Ind. 7, 62 (1896).
Chamaeraphis spinescens Poir. var. *brunoniana* Hook. f., Fl. Brit. Ind. 7, 62 (1896).

Distribution: Bengal, Assam, Burma and Ceylon.

Found in swampy places or rooting at the margins of lakes and ponds and floating on the surface.

Exsicc.—*U Thein Lwin* 605, Burma; *N. L. Bor* 18118, Manipur.

2. ***Pseudoraphis minuta*** (Mez) Pilger in Notizbl. Bot. Gart. Berlin 10, 210 (1928).

Chamaeraphis gracilis Hack. in Hook. f., Fl. Brit. Ind. 7, 62 (1896) non Hack. in Engl. Bot. Jahrb. 6, 236 (1885) (the latter is *Setaria laxa* Merr.).

Chamaeraphis minuta Mez in Notizbl. Bot. Gart. Berlin, 7, 48 (1917).

Distribution: Bengal, Assam, Bihar.

An extremely pretty grass with dense panicles of small spikelets which vary in colour from reddish-green to deep purple-red. The plants root in mud at the edge of bheels or lakes and send out their culms floating upon the water. In Assam it covers areas which can be measured in square yards. Mooney notes on a specimen collected by him by the edge of Sar Lake Cut, Puri, "An aquatic grass growing in water up to 9 in. deep and on damp ground. The water is slightly brackish. The grass tends to grow in small gregarious patches."

Exsicc.—*N. L. Bor* 18544, Assam; *H. F. Mooney* 3031, Puri.

- ✓ 4. ***Pseudoraphis spinescens*** (R.Br.) Vickery in Proc. Roy. Soc. Queensl. 62, n. 7, 69 (1952).

Andropogon squarrosus in Herb. Linn. non Linn. f., Suppl. Pl. 433 (1781) nomen dubium [see under *Vetiveria zizanioides* (*Andropogoneae*)].
Panicum squarrosum (Linn. f.) Lamk., Encycl. Meth. Bot. 4, 733 (1798).

P. spinescens R.Br., Prodr. 193 (1810).

P. asperum Koen. in Naturforscher 23, 209 (1788) non *P. asperum* Lamk. (1778).

P. abortivum R.Br., Prod. 193 (1810).

Chamaeraphis spinescens (R.Br.) Poir. in Lamk., Encycl. Meth. Bot., Suppl. 2, 189 (1811).

Ch. abortiva (R.Br.) Poir. in Lamk., loc. cit. 189.

Anatherum squarrosum (Linn. f.) P. Beauv., Ess. Agrost. 128, 156 (1812).

Pseudoraphis squarrosa (Linn. f.) Chase var. *subglabra* (Thw. ex Trim.)
Senaratna, Grass. Ceyl. 153 (1956).

Distribution: Ceylon.

Exsicc.—Thwaites C.P. 3877, Ceylon.

Rhynchelytrum Nees in Lindley, Nat. Syst. ed. 2, 446 (1836).

Monachyron Parl. in Hook., Niger Fl. 190 (1849).

Key to the species of *Rhynchelytrum*

1. Pedicels of the spikelets with a few long hairs; lower glume 0.6 mm below the upper, bearded at the base, elsewhere pilose *R. repens*
1. Pedicels of the spikelets without long hairs; lower glume 0.8 mm below the upper, bearded at the base, glabrescent upwards *R. villosum*

- ✓ 1. ***Rhynchelytrum repens*** (Willd.) C. E. Hubb. in Kew Bull. 1934, 110 (1934).

Saccharum repens Willd., Sp. Pl. 1, 322 (1798).

Tricholaena rosea Nees, Ind. Sem. Hort. Vratisl. 1835, and in Linnaea 11, Litt.-Bericht, 129 (1837).

Rhynchelytrum roseum (Nees) Stapf & C. E. Hubb. ex Bews, The World's Grasses 223 (1929), and in Prain, Fl. Trop. Afr. 9, 880 (1930).

Tricholaena repens (Willd.) Hitchc., Man. Grasses W. Indies [U.S. Dept. Agric. Misch. Publ. no. 213, 331] (1936).

Distribution: Tropical and South Africa, now introduced into most warm countries.

The pink feathery panicles of this grass make it a desirable object in tropical gardens. It is not of much account as a fodder grass. $2n = 36$ (Avdulov).

Exsicc.—Bourne 5047, Madras; L. J. Sedgwick 1292, Bangalore.

2. ***Rhynchelytrum villosum*** (Parl.) Chiov. in Ann. Ist. Bot. Roma 8, 310 (1908).

R. wightii Duthie, Fodd. Grass N. Ind., 21 (1888).

Tricholaena wightii Arn. et Nees in Linnaea 16, 218 (1842) nomen nudum.

Monachyron villosum Parl. in Hook., Niger Fl. 191 (1849).

Panicum megalanthum Steud., Syn. Pl. Glum. 1, 93 (1854).

Tricholaena tuberculosa Hack. ex Hook. f., Fl. Brit. Ind. 7, 65 (1896).

T. villosa Dur. et Schinz, Consp. Fl. Afr. 5, 771 (1894).

Melinis wightii Hack. in Öst. Bot. Z. 51, 464 (1901).

M. bertlingii Mez in Engl., Bot. Jahrb. 57, 195 (1921).

M. rangei Mez, loc. cit. 195.

M. pulchra Mez, loc. cit. 196.

M. barbeyana Mez, loc. cit. 196.

M. affinis Mez, loc. cit. 196.

M. mutica Mez, loc. cit. 197.

Stapf and Hubbard say [*Fl. Trop. Afr.* 9, 877 (1930)] that *Aira chinensis* Retz., *Obs. Bot.* 3, 10 (1783) cited by Hook. f., *Fl. Brit. Ind.* 7, 65 (1896) as a synonym of this species, is probably a species of *Eriachne*,* a supposition which is borne out by an examination of the type.

Distribution: Stapf and Hubbard in *Fl. Trop. Afr.* 9, 877 (1930) remark: "*R. villosum* is widely distributed throughout Tropical Africa with the exception of the West African forest belt and extends southwards slightly beyond the Tropic of Capricorn. It also occurs in Madagascar, Southern Arabia and some of the drier parts of India. It is remarkable on account of the wide range of the size of its spikelets from individual to individual or even within the same plant. This, no doubt, in connection with differences in colour and the amount of hairiness, has led to the discrimination of a number of 'species' which in our opinion cannot be maintained, particularly as they are not geographically separated."

Exsicc.—*J. R. Drummond* 14424, Punjab; *J. F. Duthie* 6746, Rajputana.

***Sacciolepis* Nash** in Britton, *Man. Fl. North.*
Stat. Canada 89 (1901).

This generic name has been spelt in two different ways, some authors, including the writer, spelling it *Saccollepis*, and others *Sacciolepis*. In the first impression of Britton's Manual, where the new genus was published, the name was spelt *Sacciolepis*. In the second impression, which appeared four months after the first, the name was changed to *Saccollepis* in the generic description but the spelling *Sacciolepis* remained in the key and index. The second edition of the Manual, which appeared in 1907, that is, six years after the first, the name was also spelt *Saccollepis* on page 89, but *Sacciolepis* in the key and index. Nash himself, however, appears to have favoured the spelling *Sacciolepis*, and this has been adopted by all writers in recent years. Etymologically the correct spelling can either be *Saccollepis* or *Sacciolepis* from *σακκος*, a bag, or *σακκιον*, a little bag, and *γρεπις*, a scale; the reference, of course, being to the saccate upper glume. For this reason the spelling *Sacciolepis* is adopted here and should be followed in future.

Key to the species of *Sacciolepis*

1. Inflorescence a true panicle, effuse, branched; pedicels for the most part longer than the spikelets *S. curvata*
1. Inflorescence a spiciform cylindrical dense panicle; pedicels shorter than the spikelets:—
 2. Spikelets subglobose, blunt *S. myosuroides*
 2. Spikelets obliquely lanceolate in outline; tips acute:—

* See page 479.

3. Culms robust, usually spongy below; lower glume less than half the length of the spikelets; spikelets 4–5 mm long, usually in interrupted crowded fascicles *S. interrupta*
3. Culms slender, never spongy; lower glume half as long as the spikelet; spikelets 2.5–3.5 mm long, in continuous pseudo-spikes *S. indica*

1. ***Sacciolepis curvata* (Linn.) A. Chase** in Proc. Biol. Soc. Wash. **21**, 8 (1908).

Panicum curvatum Linn., Syst. Nat. ed. 12, 2, 732 (1767).

P. coryophorum Kunth, Rév. Gram. **1**, 387 (1831), t. 107.

Distribution: Madras State, Ceylon, East and South Africa.

This small creeping slender annual is probably not of much account as a fodder grass.

Exsicc.—Herb. Wight. 3040, Madras.

✓ 2. ***Sacciolepis indica* (Linn.) A. Chase** in Proc. Biol. Soc. Wash. **21**, 8 (1908).

Aira spicata Linn., Sp. Pl. ed. 1, 63 (1753).

A. indica Linn., Sp. Pl. ed. 1 (1753) in "Errata". (Linnaeus changed the name because of *Aira spicata* on p. 64 of Sp. Pl.)

Panicum indicum Linn., Mant. Pl. **2**, 184 (1771) non *P. indicum* Mill. (1768).

P. conglomeratum Linn., Mant. Pl. **2**, 324 (1771).

P. microstachyum Lamk., Tab. Encycl. Meth. Bot. **1**, 170 (1791).

P. myuros Lamk., loc. cit. 172, per errorem *myruos*.

P. arcuatum R.Br., Prodr. 189 (1810).

P. phalarioides Roem. et Schult., Syst. Veg. **2**, 452 (1817).

P. contractum Wight et Arn. ex Nees in Linnaea **10** (1836) Litt.-Ber. 117.

P. angustum Trin., Sp. Gram. Ic. (1836), t. 334.

Hymenachne indica Büse in Miq., Pl. Jungh. 377 (1854).

Sacciolepis spicata (Linn.) Honda in Tokyo Univ. J. Fac. Sci. Bot. **3**, 261 (1930).

Distribution: Tropical and subtropical India from Garhwal eastward and southward, tropical Asia, Polynesia to Australia. Introduced into Africa and America.

This species is common in the plains and ascends in the Himalaya to an altitude of 2000 m. It is often gregarious in swampy places in the hills where it reaches a height of 1 m or more. It is extremely variable in the amount of indumentum present and in the colour of the spikelets, the latter being often more or less suffused with purple. Among the specimens preserved at Kew, there are a number of abnormalities. For example, in some specimens the spikelets are more or less proliferous, in others, instead of the spike-like inflorescence the inflorescence is paniculate, at least towards the base; in others again, there are several spikes umbellately arranged at the tip of the peduncle.

Exsicc.—*C. B. Clarke* 43549, Khasia; *J. F. Duthie* 5023, Garhwal; *Wallich* 8698, Burma.

- ✓ 3. ***Sacciolepis interrupta* (Willd.) Stapf** in Prain, Fl. Trop. Afr. 9, 757 (1920).

Panicum interruptum Willd., Sp. Pl. 1, 341 (1798).

Hymenachne interrupta Büse in Miq., Pl. Jungh. 1, 377 (1854).

P. indicum Hack. in Bolet. Soc. Brot. 5, 210 (1887) non Linn. (1771).

P. inundatum Kunth, Rév. Gram. 1, 34 (1829).

P. turritum Thunb. in Mus. Nat. Acad. Upsal. 10, 148 (1791) nomen.

P. uliginosum Roth, Nov. Pl. Sp. 50 (1821).

Distribution: Tropics of South-east Asia.

This species is usually found in swamps or growing upon soil which is periodically inundated. The stems are very spongy below and are greedily eaten by buffaloes and, where they can be reached, by cattle also.

Exsicc.—*J. F. Duthie* 10006, Madhya Pradesh.

- ✓ 4. ***Sacciolepis myosuroides* (R.Br.) A. Camus** in Lecomte, Fl. Gén. de l'Indo-Chine 7, 460 (1922).

Panicum myosuroides R.Br., Prodr. 189 (1810).

Hymenachne myosuroides Balansa in Morot, J. de Bot. 4, 143 (1890).

Distribution: Tropics of Asia and Australia.

A very distinct species which is usually found growing in damp places.

Exsicc.—*T. Thoms.* s.n., Gangetic Plain; *G. A. Gammie* 18669, Kangra.

Setaria P. Beauv., Essai Agrost. 51 (1812), t. 13, fig. 3;
nomen genericum conservandum non Michx. (1803).

Chaetochloa Scribn. in Unit. Stat. Dept. Agri.
Div. Agrost. Bull. 4, 38 (1897).

Key to the species of *Setaria*

1. Spikelets solitary in the involucre: if several together then the inflorescence not spicate with yellowish or rufous bristles:—
2. Inflorescence a cylindric and dense or sometimes lobed spiciform panicle: blades folded or flat:—
 3. Plants perennial; panicle cylindric, dense *S. geniculata*
 3. Plants annual with a cylindric panicle or perennial and then with a loose often lobed panicle:—
 4. Bristles retrorsely barbed *S. verticillata*
 4. Bristles antrorsely barbed:—
 5. Upper glume as long as the upper lemma; the latter quite smooth or minutely rugulose:—
 6. Spikelets persistent in large often lobed false spikes; lower lemma epaleate *S. italica*
 6. Spikelets deciduous; false spikes not lobed or interrupted but cylindric; lowest lemma paleate *S. viridis*

5. Upper glume shorter than the upper lemma, the latter rugose:—
 7. Inflorescence a cylindric false spike:—
 8. Spikelets 3 mm long; upper lemma coarsely rugose, boat-shaped and slightly keeled upwards, broad and dorsally strongly curved in profile *S. glauca*
 8. Spikelets 2.25 mm long; upper lemma usually finely rugose, narrow and dorsally gently curved, not at all keeled *S. pallide-fusca*
 7. Inflorescence a narrow panicle, sometimes loosely lobed below and tapering upwards:—
 9. Panicle not more than 5 mm wide, very slender, with spaced spikelets not more than 2 mm long; leaves very hairy *S. gracillima*
 9. Panicle not as above, very much wider, spikelets crowded or loosely scattered:—
 10. Annual; spikelets up to 2 mm long *S. tomentosa*
 10. Perennial; spikelets 2.5–3 mm long *S. forbesiana*
2. Inflorescence a dense or rather loose, narrow or widely spreading panicle; leaves folded fan-fashion between the longitudinal nerves:—
 11. Perennials:—
 12. Panicle very dense; branches not more than 8 cm long:—
 13. Spikelets definitely secund on the very close branches; upper glume longer than half the upper lemma *S. poiretiana*
 13. Spikelets less secund on the branches; upper glume half as long as the upper lemma or less *S. megaphylla*
 12. Panicle very lax; branches usually very much longer:—
 14. Slender grass; panicle not more than 25 cm long and 5 cm wide; lateral branches spiculate to the base; spikelet 3.5–4 mm long; leaves up to 3 cm wide *S. plicata*
 14. Robust grasses; inflorescence much more than 25 cm long, up to 50 cm long by 20 cm wide; spikelets 3 mm long:—
 - 14a. Bristle below the spikelet not more than twice as long as the spikelet *S. palmifolia*
 - 14a. Bristles below the spikelet up to five times as long as the spikelet *S. paniculifera*
 11. Annuals:—
 15. Upper glume half to three-quarters the length of the upper lemma; lower floret male or barren; branches of the panicle divided from the base and bearing short racemes; spikelets elliptic-acute, crowded *S. barbata*
 15. Upper glume as long as or almost as long as the upper lemma; lower floret barren; branches mostly simple from the base; spikelets abruptly acute, elliptic in outline *S. homonyma*
1. Spikelets several in the involucre; inflorescence spicate, 7.5–30 cm long; bristles yellow, rufous or brown *S. sphacelata*

S. italica subsp. *viridis* (Linn.) Thell. in Mém. Soc. Sci. Nat. Cherbourg 38, 85 (1912).

Chaetochloa viridis var. *brevisetata* Farwell in Mich. Acad. Sci. Papers 1, 86 (1921).

Distribution: Cooler parts of the Old World, escaped and considered a weed in the New World. $2n = 18$ (Krishnaswamy, Tateoka).

This species is found all along the more temperate parts of the Himalaya, flourishing on the Tibetan plateau at 4000 m.
Exsicc.—E. W. Trotter 156G, Hazara.

Spinifex Linn., Mant. 2, 163 (1771).

- ✓ 1. *Spinifex littoreus* (Burm. f.) Merr. in Philip. J. Sci. Bot. 7, 229 (1912).

Stipa littorea Burm. f., Fl. Ind. 29 (1768).

Stipa spinifex Linn., Mant. 1, 34 (1767).

Spinifex squarrosus Linn., Mant. 2, 300 (1771).

Distribution: Sandy coasts of India, Ceylon and Burma.

A stout, bushy grass with long, very rigid spiny leaves, growing on the sand dunes around the coasts, where it helps to bind and control the movement of sand. The spiky heads break off and are blown about like tumbleweeds, and thus distribute the seed. The spine-like leaves are not attractive to grazing animals, though the omnivorous goat would possibly eat them. $2n = 18$ (Janaki Ammal).

Exsicc.—H. C. Levinge 9222, Puri; Thwaites C.P. 947, Ceylon.

Stenotaphrum Trin., Fund. Agrost. 175 (1820).

Diastemanthe Steud., Syn. Pl. Glum. 1, 360 (1854).

Key to the species of *Stenotaphrum*

1. Lower glume orbicular, truncate, toothed or emarginate, fimbriate, nerveless, about 1 mm long *S. dimidiatum*
1. Lower glume ovate-acute, 2–2.5 mm long, strongly 3–5-nerved *S. helferi*

- ✓ 1. *Stenotaphrum dimidiatum* (Linn.) Brongn. in Duperr., Bot. Voy. Coquille, 127 (1831).

Panicum dimidiatum Linn., Sp. Pl. ed. 1, 57 (1753).

Stenotaphrum glabrum Trin., Fund. Agrost. 176 (1820).

Distribution: Plains of India and East Africa.

A prostrate perennial grass forming mats, often in the shade of mango trees. Frequently found near the seashore. It is said to form a good pasturage.

Exsicc.—F. Ballard 1488, Ceylon; Bourne s.n., Madras.

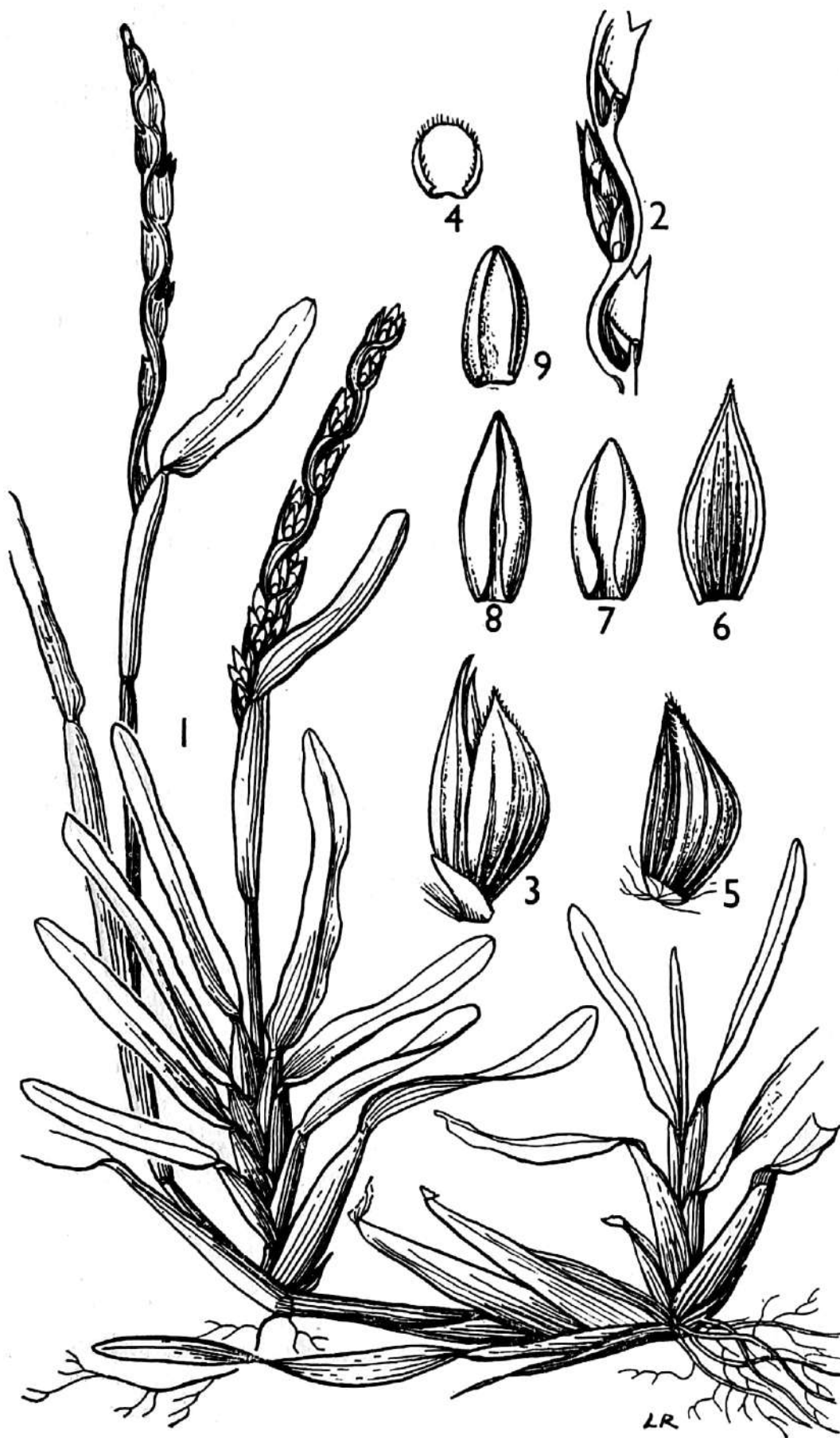


Fig. 41. *Stenotaphrum dimidiatum* (Linn.) Brongn.
 1, plant $\times 1$; 2, portion of the raceme $\times 2$; 3, spikelet, side view; 4, lower glume;
 5, upper glume from the side, not flattened; 6, lower lemma; 7, its palea; 8, upper
 lemma; 9, its palea; all $\times 6$.

BB

2. *Stenotaphrum helferi* Munro *apud* Hook. f., Fl. Brit. Ind. 7, 91 (1896).

Distribution: Lower Burma, through Malaysia, Indo-China to China.

Little is known of this species but it is likely that it has the same characteristics as the former.

Exsicc.—*Helper* 195, 801, Burma.

Stenotaphrum dimidiatum spreads widely by means of strong woody stolons, from a small portion of which a new plant will grow. It, and other members of the genus, have the peculiarity that at each node of the stolon are to be found roots which peg the stolon to the ground and also two opposite buds which give rise to leafy shoots with intravaginal branching. If left to itself it forms a coarse turf.

***Thuarea* Pers., Syn. Pl. 1, 110 (1805).**

Microthuareaia Thouars, Gen. Nov. Madag. 3 (1806).

Ornithocephalochloa Kurz in J. Bot. 13, 332 (1875).

1. ***Thuarea involuta* (G. Forst.) R.Br. ex Roem. et Schult., Syst. Veg. 2, 808 (1817).**

T. sarmentosa Pers., Syn. Pl. 1, 110 (1805).

Ischaemum involutum G. Forst., Fl. Ins. Austr. Prodr. 73 (1786).

Ornithocephalochloa arenicola Kurz, J. Bot. 13, 332 (1875), t. 171, f.1–18.

Distribution: Shores of South-east Asia.

A prostrate seashore grass. The stems creep for considerable distances in all directions over the sand, sending down rootlets from the nodes into the soil and very short vertical axial shoots upwards which bear the leaves and the inflorescences.

The development of the false fruit and the methods of dispersal are so extraordinary that it will be of interest to note them, briefly, in this place. The process was described by Dr. Margaréte Nieuwenhuis-Uexküll in the *Annales du Jardin Buitenzorg*, a journal which is not generally available.

As mentioned above, the vertical inflorescence-bearing shoots are only a few centimetres high. Soon after anthesis these shoots bend at the nodes so that the ripening fruit of the inflorescence may get buried in the sand.

The inflorescence consists of an axis which is firmly attached to the peduncle. The axis itself is very broad about the insertion of the fertile spikelets, but is narrower at the distal end where the male spikelets are attached. After the male spikelets have shed their pollen and fallen the male axis or beak begins to fold down over the ripening fertile spikelet, the hinge-point being just about where the fertile spikelet is attached. The ripening fertile spikelet therefore becomes enclosed between the broadest

part of the axis and the peduncle, the latter being completely enclosed by the former. The caryopsis is in this way encased in a watertight compartment. As stated, the false fruits may be thrust into the sand, but if they are washed out they are capable of floating freely in sea-water, and, as the viability of the seed is considerable, it can be carried to distant shores. Exsicc.—*A. H. G. Alston* 2357, Ceylon; *D. Prain* s.n., Great Cocos Island.

Trachys Pers., Syn. Pl. 1, 85 (1805).

Trachyozus Reichenb., Consp. Regn. Veg. 48 (1828).

Trachystachys A. Dietr. in Linn., Sp. Pl. ed. 6, 2, 16 (1833).

1. *Trachys muricata* (Linn.) Pers. ex Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 3, 189 (1834).

Cenchrus muricatus Linn., Mant. 2, 302 (1771).

Panicum squarrosus Retz., Obs. Bot. 4, 15 (1786).

Trachys mucronata Pers., Syn. Pl. 1, 85 (1805).

Trachyozus muricata (Linn.) Steud., Syn. Pl. Glum. 1, 112 (1854).

This species is found in Madras and Burma, particularly in the coastal areas, but it also penetrates inland and has been found at Salem. It is of some value as a fodder in the young stages before the inflorescences ripen, but the hard prickly burrs in the mature stages must be an infernal nuisance to grazing animals.

Persoon, Syn. Pl. 1, 85 (1805), makes the combination *Trachys mucronata* quoting *Cenchrus mucronatus* Linn. and *Panicum squarrosus* Retz. as synonyms. There is no Linnean species *Cenchrus mucronatus*, but there is a *Cenchrus muricatus* Linn. Persoon evidently made a mistake which Trinius corrected in the words "*Trachys muricata* Pers. (lapsu calami *mucronata dicta*)".

Exsicc.—*Wallich* 8674, Madras; *Bourne* 4745, Madras; *U Thet Su*, Magwe.

Tricholaena Schrad. ex Roem et Schult., Syst. Veg. 2, Mant. 163 (1824).

Xylochlaena Stapf in Hook., Ic. Pl. t. 3098 (1922).

Eremochlamys A. Peter in Fedde, Rep. Sp. Nov., Beiheft 40, 164 (1930).

1. *Tricholaena teneriffae* (Linn. f.) Link, Handb. Erkenn. Gewächse 1, 91 (1829); Parl. in Webb et Berth., Hist. Nat. Canar. 3, 425 (1849–50).

Saccharum teneriffae Linn. f., Suppl. 106 (1781).

Melinis teneriffae (Linn. f.) Hack. in Öst. Bot. Z. 51, 464 (1901).

Tricholaena micrantha Schrad. ex Schult., Syst. Veg. 2, Mant. 163 (1824).

Panicum plumosum Presl, Fl. Sic. 1, xliii (1826).

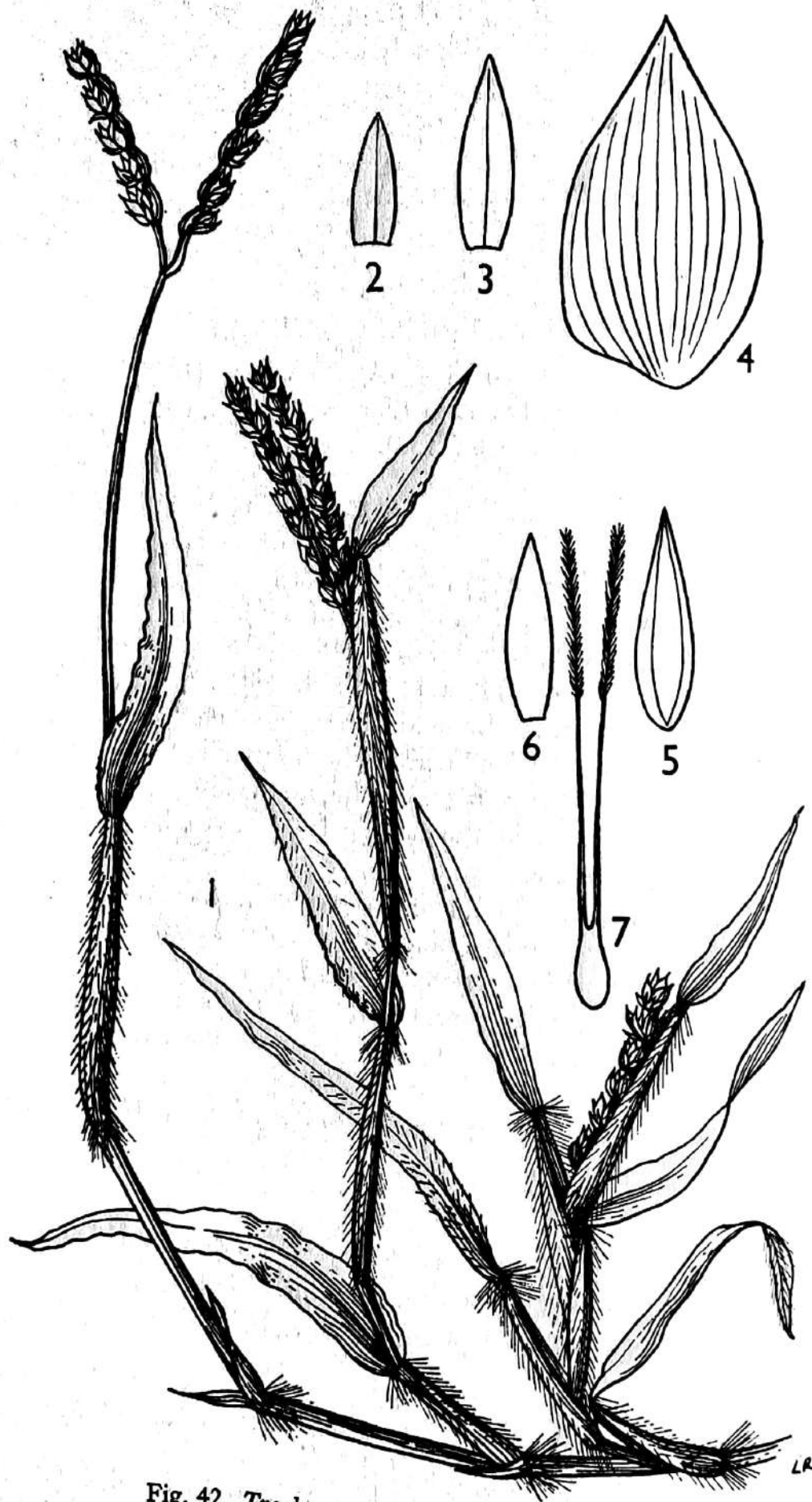


Fig. 42. *Trachys muricata* (Linn.) Pers. ex Trin.
 1, plant $\times \frac{1}{4}$; 2, lower glume of fertile spikelet; 3, upper glume; 4, lower lemma;
 5, upper lemma; 6, palea of the upper lemma; 7, pistil with two long styles and
 feathery stigmas; all $\times 6$.

P. saccharoides Trin., Gram. Panic. 245 (1826).

P. teneriffae (Linn. f.) R.Br., Prodr. 189 (1810).

Agrostis plumosa Tenore, Fl. Nap. Prodr. Suppl. 1, lix (1811–15).

Distribution: The Mediterranean region, through Arabia, Sinai, Baluchistan into north-west India, extending to West and East Tropical Africa.

As this grass grows in some of the most inhospitable parts of the earth, it is probably welcomed as a fodder by the grazing animals unfortunate enough to find themselves in such regions. Goats would certainly eat it.

$2n = 40$.

Exsicc.—J. R. Drummond 15073, Punjab.

The following species of *Tricholaena* has been reported recently from Baluchistan where it has been introduced. It differs from the above species of *Tricholaena* in that the spikelets are glabrous or very minutely pubescent and not densely pilose or villous as in *T. teneriffae*.

Tricholaena monachne (Trin.) Stapf et C. E. Hubb. in Prain, Flor. Trop. Afr. 9, 909 (1930).

Distribution: West Africa, South Africa, Mauritius, Mozambique.

This species is easily taken for a species of *Panicum*. The lower glume, however, is usually a microscopic scale and much smaller than in many of the Indian species of *Panicum*. $2n = 36$.

Urochloa P. Beauv., Essai Agrost. 52 (1812), t. 11, fig. 1.

Key to the species and varieties of *Urochloa*

1. Lower lemma with a very conspicuous fringe of bristles:—
 2. Annuals:—
 3. Lower glume lanceolate-acute, as long as the spikelet or nearly so
U. trichopus
 3. Lower glume rounded, about one-third the length of the spikelet or less:—
 4. Spikelets glabrous *U. panicoides* var. *marathensis*
 4. Spikelets densely covered with a velvety pubescence
U. panicoides var. *velutina*
 2. Perennial with a praemorse rhizome; lower glume ovate-lanceolate, three-quarters the length of the spikelet or less, often with a single bristle from a small central tubercle *U. mosambicensis*
1. Lower lemma without a fringe of bristles, glabrous or shortly velvety-pubescent:—
 5. Annual; lower glume less than one-half the length of the spikelet
U. panicoides
 6. Spikelets glabrous var. *panicoides*
 6. Spikelets pubescent var. *pubescens*

5. Perennials:—

7. Basal buds covered with a yellowish or white tomentum; lower glume over three-quarters the length of the spikelet

U. pullulans

7. Basal buds not covered with a yellowish tomentum; lower glume less than three-quarters the length of the spikelet

U. bolbodes

1. ***Urochloa bolbodes* (Steud.) Stapf** in Prain, Fl. Trop. Afr. 9, 593 (1920).

Helopus bolbodes Steud., Syn. Pl. Glum. 1, 100 (1854).

Panicum oligotrichum Fig. et de Not. in Mem. Ac. Torin. ser. 2, 14, 333 (1854), t. 10, f. 1–14.

P. bolbodes (Steud.) Schweinf., Beitr. Fl. Aethiop. 300 (1867).

P. numidianum Hack. in Bull. Herb. Boiss. 4, App. 3, 14 (1896) non Lamk. (1791).

Eriochloa bolbodes (Steud.) Schweinf. in Bull. Herb. Boiss. 2, App. 2, 17 (1894).

Distribution: Tropical Africa—introduced.

Said to be an excellent fodder for cattle. $2n = 36$.

2. ***Urochloa mosambicensis* (Hack.) Dandy** in J. Bot. 69, 54 (1931).

Panicum mosambicense Hack. in Bolet. Soc. Brot. 6, 140 (1888).

P. notabile Hook. f., Fl. Brit. Ind. 7, 32 (1896).

Echinochloa notabile (Hook. f.) Rhind, Grasses of Burma, 50 (1945).

Distribution: This grass has the extraordinary distribution of East Africa and Burma.

It is said to be an excellent fodder grass. $2n = 42, 30$.

Exsicc.—*D. Rhind* 2611, Burma; *Wallich* 8723, Burma.

3. ***Urochloa panicoides* P. Beauv.**, Ess. Agrost. 53 (1812), t. 11, fig. 1. var. ***panicoides***.

Panicum controversum Steud., Syn. Pl. Glum. 1, 60 (1854).

P. urochloa Desv., Opusc. 82 (1831).

Setaria pilifera Spreng., Syst. Veg. 4, cur. post. 33 (1827).

Panicum panicoides (P. Beauv.) Hitchc. in J. Acad. Sci. Wash. 9, 551 (1919).

Distribution: India, Tropical East Africa, extending to South Africa.

This is the glabrous variant of the species.

Exsicc.—*J. R. Drummond* 21151, Punjab; *Bourne* s.n., Mysore.

var. ***pubescens* (Kunth) Bor**, stat. nov. spiculis pubescentibus.

Panicum hirtum Roth, Nov. Pl. Sp. 46 (1821) non Lamk. (1798).

P. helopus Trin. in Spreng., Neue Entdeck. 2, 84 (1821).

P. rothii Spreng., Syst. Veg. 1, 310 (1825).

Urochloa pubescens Kunth, Rév. Gram. 1, 31 (1829).

Distribution: Same as the variety *panicoides*.

This is the pubescent variant of the species.

Exsicc.—*H. H. Haines* 84, Bihar; *J. F. Duthie* 6531, Agra.

- ✓ var. **marathensis** (Henr.) Bor, stat. nov.
Urochloa marathensis Henr. in Meded. Rijks Herb. Leiden, n. 43, 2 (1922).

Distribution: Bombay State, Maratha country and north Kanara.

Exsicc.—Type at Leiden.

- ✓ var. **velutina** (Henr.) Bor, comb. nov.
U. marathensis Henr. var. *velutina* Henr. loc. cit. 2.

Distribution: Bombay State, Poona.

Exsicc.—T. Cooke s.n., Bombay.

4. **Urochloa pullulans** Stapf in Prain, Fl. Trop. Afr. **9**, 590 (1920).
Panicum geminatum Schweinf. in Bull. Herb. Boiss. **2**, app. 2, 19 (1894) non Forssk. (1775).

Distribution: Tropical Africa.

This species grows in dense tufts and provides coarse grazing for cattle. In Africa the grain is said to be eaten by the poorer people in times of famine. This grass has been introduced into India. $2n = 28$.

5. **Urochloa trichopus** (Hochst.) Stapf in Prain, Fl. Trop. Afr. **9**, 589 (1920).

Panicum trichopus Hochst. in Flora **27**, 254 (1844).

P. trichopodon A. Rich., Tent. Fl. Abyss. **2**, 369 (1851).

P. papillosum Fenzl ex Steud., Syn. Pl. Glum. **1**, 100 (1854).

Helopus trichopus Steud., loc. cit. 100.

Eriochloa trichopus (Hochst.) Benth. in J. Linn. Soc. (Bot.) **19**, 39 (1881).

Distribution: Tropical Africa, introduced into India.

This grass is said to be an excellent fodder. $2n = 30$.

GROUP II

Key to the tribes of the Pooideae

1. Spikelets large, solitary at the tip of the peduncle, subtended by a spathe-like sheath, 2-flowered; glumes absent; lemmas fused in their lower halves as are also the paleas; stigma 1 **Lygeae**
1. Spikelets not as above:—
 2. Spikelets borne in open or contracted or spike-like panicles less often in racemes or spikes†:—
 3. Spikelets usually with two or more fertile florets, or if with one fertile floret then with sterile reduced florets above it*:—
 4. Lemma and rhachilla glabrous or hairy, but with the hairs not enveloping the lemma, or if so, then the lemma with a geniculate awn; low or moderately tall grasses:—
 5. Glumes usually shorter than the lowest floret and with the upper floret distinctly exserted, rarely longer and then with firm dull margins like the lemmas, or if with hyaline margins then the lemma firmly keeled; lemmas awnless or with a straight or curved awn from the entire or bifid apex, or several-awned or -lobed:—
 6. Lemmas usually 5- to many-nerved, awnless or awned; awn usually simple, not kneed or twisted below the knee:—
 7. Lemmas if awned, with 1 awn (if more-awned, tip of ovary hairy), if awnless, lemmas not 7-9-nerved or strongly compressed:—
 8. Spikelets 2-3-flowered, turbinate; glumes narrow, persistent; lower two lemmas empty, flabelliform, 4-lobed, dorsally shortly awned **Pommereulleae**
 8. Spikelets not as above:—

† Genera with the spikelets in racemes or spikes, for which it is difficult to make allowance in a key without excessive duplication, are: (1) *Brachypodium* (*Brachypodieae*) which has cylindrical spikelets and a hairy appendage to the ovary; (2) *Eragrostiella* (*Eragrosteae*) with filiform leaves and compressed, many-flowered *Eragrostis*-like spikelets; (3) *Pommereulla* (*Pommereulleae*) which has very unequal glumes and awned 4-lobed lemmas; (4) *Psilurus*, *Lolium* (*Festuceae*) which are without a lower glume; (5) *Tripogon*, *Indopoa* (*Eragrosteae*) which have the lower glume toothed on one margin; (6) some species of *Aeluropus* which have many-flowered spikelets with hairy 7-9-ribbed lemmas, and (7) *Perotis* (*Perotideae*) which has 1-flowered spikelets and long-awned glumes.

* See Chlorideae

GRASSES OF INDIA, BURMA AND CEYLON

9. Leaves usually broad, always with numerous cross nerves; inflorescence a panicle **Centothecae**
9. Leaves tessellately nerved or not:—
10. Stigmas 2–3, spirally coiled, retrorsely barbed; rhachilla-joint at the base of each floret acting as a hook for attachment to fur of passing animals; inflorescence a raceme **Streptogyneae**
10. Stigmas 2, not spirally coiled nor retrorsely barbed; caryopses not distributed by means of a hook-like rhachilla but by other means:—
11. Ovary with a hairy appendage at the apex; styles borne laterally below the appendage:—
12. Inflorescence of racemes or in panicles; awn inserted below the entire or 2-lobed tip (lemmas 7–9-awned in *Boissiera*) **Bromeae**
12. Inflorescence a raceme; awn terminal **Brachypodieae**
11. Ovary glabrous at the apex, or if hairy at least without a hairy appendage:—
13. Lemmas dull, membranous to coriaceous, exerted from the glumes; glumes 2 or 1 (upper glume only present in *Psilurus*, *Lolium*) **Festuceae**
13. Lemmas membranous and shining, the upper represented by a bundle of empty, rudimentary lemmas; glumes 2 **Meliceae**
7. Lemmas 9-awned or if awnless, lemmas 7–9-nerved, strongly compressed or rounded; ovary not hairy:—
14. Lemmas 9-nerved; the nerves produced as 9 awns **Pappophoreae**
14. Lemmas 7–9-nerved; nerves not produced as awns:—
- 14a. Inflorescence a simple spike or globular head of spikelets; spikelets villous; leaves rigid, pungent; ligule a rim of hairs **Aeluropodeae**
- 14a. Inflorescence a panicle; ligule not a hairy rim:—
- 14b. Spikelets several flowered with conspicuously nerved lemmas; ligules membranous **Glycerieae**
- 14b. Spikelets 1-flowered; lemmas faintly 7-nerved; leaves extraordinarily thin; ligule absent **Hubbardieae**
6. Lemmas 1–3-nerved; inflorescence of panicles or racemes:—
15. Inflorescence of panicles; if racemes or spikes the spikelets not secund **Eragrosteae**

15. Inflorescence of racemes or panicles of racemes, the spikelets secund **Chlorideae**
5. Glumes usually as long as or longer than the lowest floret, often as long as the spikelet and enclosing the florets, if shorter than the lowest floret, then the palea with two awns (*Massia*):—
 16. Lemmas awnless or awned from the back, rarely from the tip; awn usually kneed; ligules membranous **Aveneae**
 16. Lemmas awned from the sinus between the two terminal lobes or no trace of an awn, often only a mucro; ligule a hairy rim **Danthonieae**
4. Lemmas or rhachilla-joints bearing long silky hairs which envelop the lemma (at least in fertile florets); lemmas awnless or with a straight awn from the tip, often thin; tall grasses with usually large plume-like panicles **Arundineae**
3. Spikelets with one fertile floret (male or female in unisexual 1-flowered spikelets), with or without one or two male or barren florets below it, the latter often much reduced:—
 17. Glumes minute (usually represented by two semicircular inconspicuous lips) or suppressed; fertile lemma and palea very similar in shape and texture; spikelets firmly compressed; stamens usually six; florets hermaphrodite or unisexual **Oryzeae**
 17. Glumes well developed; fertile lemma and palea not similar:—
 18. Spikelets with 3 florets, the lower two represented by empty lemmas which are often minute and occasionally one of them absent:—
 19. Lower florets represented by two more or less well-developed lemmas, one or both of which are transversely ridged or flanged, if smooth or hairy, not golden brown or black in colour **Ehrharteae**
 19. Lower florets well developed or minute and sometimes one absent, never transversely rugose or flanged, sometimes silky, golden brown to almost black **Phalarideae**
 18. Spikelets with 1 or 2 florets:—
 20. Spikelets with 2 florets; the lower, male or barren, the upper hermaphrodite:—
 21. Spikelets falling with part of the pedicel attached or leaving the glumes attached to the pedicel; grains elliptic to oblong or terete, not globose:—
 22. Lower floret empty and without a palea; glumes up to half the length of the spikelet; rhachilla produced beyond the upper floret and sometimes bearing an empty lemma; spikelets falling with part of the pedicel attached **Thysanolaeneae**
 22. Lower floret male or barren, usually with a palea; upper glume as long as the spikelet; rhachilla dis-

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articulating below the upper floret and not produced beyond it; glumes more or less persistent:—

- 22a. Glumes equal in size, obtuse or mucronate; upper lemma unawned **Isachneae**

- 22a. Glumes unequal, the lower acute, the upper acuminate; upper lemma awned with a perfect awn or at least a bristle **Arundinelleae**

21. Spikelets falling entire; lemmas and glumes membranous; lower floret barren; upper hermaphrodite; grain globose, wrinkled, splitting the palea at maturity **Phaenospermeae**

20. Spikelets with one fertile floret:—

23. Spikelets cylindrical, falling entire; base of the glumes bearded; lemma awned (see also *Agrostis stewartiana*, *A. semiverticillata*, *Polypogon* spp. of the *Agrostideae*) **Garnotieae**

23. Spikelets cylindrical, ellipsoid-acute or definitely laterally compressed, not bearded at the base; rhachilla disarticulating above the more or less persistent glumes:—

24. Leaf-blades linear to narrowly linear, flat or rolled, sessile:—

25. Spikelets very rarely falling entire and then with firmly membranous to coriaceous, awned or 5-nerved lemmas:—

26. Lemmas hyaline or membranous at maturity, rarely indurated and then laterally compressed, awnless or awned from low down on the back, or from the middle or from the entire or bifid tip:—

27. Lemmas usually 3–5-nerved, frequently awned; glumes longer and firmer than the hyaline lemma or when the lemma is longer than the latter, indurated; grains usually with an adhering pericarp **Agrostideae**

27. Lemmas 1–3-nerved, awnless; glumes and lemmas very similar in texture, hyaline or thinly membranous, shining; grain usually with a free pericarp **Sporoboleae**

26. Lemmas indurated or rigid at maturity, terete or dorsally compressed:—

28. Spikelets awned:—

29. Awns trifid

29. Awns simple, sometimes flanked by 2 bristles **Aristideae**

28. Spikelets not awned **Stipeae**

25. Spikelets falling entire at maturity, either singly or **Milieae**

- in clusters from the axis of slender spike-like panicles or racemes; lemma delicate, 1-3-nerved:—
- 29a. Spikelets fascicled or solitary; glumes not awned **Zoysieae** //
- 29a. Spikelets solitary; glumes awned **Perotideae**
24. Leaf-blades oblong or elliptic-oblong, petioled, tessellately nerved **Phareae**
2. Spikelets sessile or shortly pedicelled along one side of the rhachis of solitary, digitate, or scattered spikes, spike-like racemes (with one fertile floret and 1-3-nerved lemmas) or on opposite sides of the rhachis of solitary spikes or racemes (care must be taken that certain genera of the *Andropogoneae* in which the pedicelled spikelet is suppressed or reduced are not placed in this section):—
30. Spikelets on opposite sides of the rhachis of solitary spikes or spike-like racemes:—
31. Ovary hairy, especially at the apex; grain often longitudinally grooved, with the linear hilum as long as the grain; starch grains simple; lodicules hairy; lemmas 3-5 or more nerved **Triticeae** ✓
31. Ovary glabrous; grain not grooved; hilum small, basal or sub-basal; starch grains compound or simple; lodicules glabrous; lemmas 1-3-nerved:—
32. Lemma of the first floret with its back adjacent to the rhachis; lower glume completely absent **Leptureae**
32. Lemma of the first floret with one side adjacent to the rhachis; both glumes developed, placed side to side **Monermeae**
30. Spikelets secund on a tough rhachis; 1-2 florets hermaphrodite with sterile florets above; inflorescence of digitate or solitary spikes or panicle of spikes **Chlorideae**

POOIDEAE—AELUROPODEAE

AELUROPODEAE *Neuski* (in Act. Inst. Bot. Acad. Sci. U.R.S.S. ser. 1, fasc. 4, 336 (1937) based on *Aeluropus* Trin., Fund. Agrost 143 (1820)) see addenda 1973

Spikelets all alike, hermaphrodite, laterally compressed, 6- to many-flowered; rhachilla disarticulating above the glumes and between the florets, produced beyond the topmost floret. Glumes unequal, persistent, membranous, rounded on the back, apiculate, mucronate or cuspidate, the lower 1-3-nerved, the upper much larger, 5-7-nerved; lemmas longer than the glumes, 7-9-nerved, membranous; paleas as long as the lemmas, hyaline, 2-keeled, 2-nerved, with broad flaps, smooth or ciliate on the keels. Lodicules 2, obliquely truncate. Stamens 3. Ovary glabrous; styles 2; stigmas plumose; grain ovoid to oblong, free between the lemma and palea; hilum punctiform.

Perennial herbs. Leaf-blades coriaceous, pungent, convolute, with panicoid anatomy; silica-cells cross-shaped or intermediate between cross- and dumb-bell-shaped; hairs 2-celled, swollen. Spikelets loosely spicate or collected into dense heads. Ligule a ridge of short hairs. Chromosomes small; basic number 10.

Genus: *Aeluropus*.

Aeluropus Trin., Fund. Agrost. 143 (1820).

Calotheca Desv. ex Spreng., Anleit. 2, 1, 167 (1817).

Chamaedactylis Nees, Gen. Fl. Germ. Monocot. 1, n. 67 (1843).

Key to the species of *Aeluropus*

1. Inflorescence of globose, elliptic, or oblong heads of closely crowded spikelets *Ae. lagopoides*
1. Inflorescence elongate, of widely spaced spikes, fascicles or solitary spikelets:—
 2. Inflorescence of several spikes of spikelets on a central axis; lemma nearly glabrous, 2.5 mm long *Ae. littoralis*
 2. Inflorescence of spikes of spikelets, fascicles or solitary spikelets; lemmas hairy, 3–3.5 mm long *Ae. macrostachyus*

✓ 1. *Aeluropus lagopoides* (Linn.) Trin. ex Thw., Enum. Pl. Zeyl. 374 (1864): per errorem *lagopodioides*.

Dactylis lagopoides Linn., Mant. 33 (1767).

D. brevifolia Koenig ex Willd., Sp. Pl. 1, 410 (1798).

D. repens Desf., Fl. Atlant. 1, 79 (1798), t. 15.

Sesleria lagopodioides Spreng., Pugill. 2, 22 (1815) per errorem *Sesleria*.

Poa tunetana Spreng., loc. cit. 20.

P. lagopodioides Kunth, Rév. Gram. 1, 111 (1829).

P. repens M.B., Fl. Taur. Cauc. 3, 69 (1819).

Aeluropus laevis Trin., Fund. Agrost. 143, 212 (1820).

Calotheca repens Spreng., Syst. Veg. 1, 347 (1825).

C. miliaca Spreng., loc. cit. 348.

Koeleria lagopoides (Linn.) Panz. ex Spreng., loc. cit. 332.

Aeluropus villosus Trin. ex C. A. Mey., Verz. Pfl. Cauc. 18 (1831).

Ae. brevifolius (Koenig) Nees ex Steud., Nom. Bot. ed. 2, 1, 30 (1840).

Ae. repens (Desf.) Parl., Fl. Ital. 1, 462 (1848).

Ae. concinnus Fig. et de Not. in Mem. Acad. Torin. ser. 2, 12, 257 (1852).

Dactylis lagopodioides Dalz. et Gibs., Bomb. Fl. 298 (1861).

Aeluropus lagopoides (Linn.) Trin. ex Trim., Cat. Ceyl. Pl. 110 (1885); Chiov. in Ann. Ist. Bot. Roma 8, 375 (1908); Druce in Rep. Bot.

POOIDEAE—AGROSTIDEAE

AGROSTIDEAE Dumort., Obs. Gram. Belg. 83, 125 (1823)

Spikelets all alike, hermaphrodite, 1-flowered, rarely falling attached to the pedicel; rhachilla disarticulating above, rarely below the glumes, sometimes produced beyond the floret as a glabrous or penicillately hairy bristle; glumes usually persistent, usually as long as or longer than the lemma, sometimes shorter; lemmas hyaline or membranous, similar in texture to the glumes or thinner, 3–5-nerved, awnless or awned from the back or from the 2-lobed tip; awn geniculate or straight; palea usually delicate, often small or almost absent, 2-nerved. Lodicules 2, rarely 0. Stamens 3, 2 or 1. Caryopsis often tightly enclosed between the lemma and palea; hilum linear, short or up to two-thirds the length of the grain; embryo small; starch grains compound.

Annual or perennial herbs, usually with slender culms. Leaf-blades most often narrow, with festucoid anatomy; silica-cells oblong or rounded; 2-celled hairs absent; ligule membranous, glabrous. First foliage leaf of the seedling erect, narrow. Spikelets in open or contracted, sometimes spike-like panicles.

Chromosomes large; basic number 7.

<i>Genera:</i>	<i>Agrostis</i>	<i>Deyeuxia</i>
	<i>Alopecurus</i>	<i>Lagurus</i>
	<i>Apera</i>	<i>Muhlenbergia</i>
	<i>Aulacolepis</i>	<i>Phleum</i>
	<i>Calamagrostis</i>	<i>Polypogon</i>

Key to the genera of Agrostideae

1. Panicles cylindric, ovoid or spiciform, very dense:—
 2. Spikelets firmly flattened; glumes truncate at the top with the median nerve produced as a mucro: lemma awnless **Phleum**
 2. Spikelets more or less flattened but the glumes pointed at the apex; lemma awned:—
 3. Panicle ovoid or ellipsoid, very hairy; lemma very long-awned; palea present **Lagurus**
 3. Panicle cylindric, not very hairy; lemma shortly awned; palea absent **Alopecurus**
1. Panicles spreading, if dense, then not cylindric and spiciform:—
 4. Glumes long-awned; spikelets articulate below the glumes **Polypogon**
 4. Glumes not long-awned, at most shortly aristate; articulation above or below the glumes or at the base of the pedicel:—
 5. Spikelets falling with the pedicel attached:—
 6. Panicle dense, interrupted; glumes shortly aristate **Agrostis** (*A. subaristata*)

6. Panicle very effuse; glumes not aristate, they and the pedicel very scabrid
Agrostis (*A. stewartii*)
5. Spikelets disarticulating above or below the glumes:—
7. Rhachilla always produced, long, penicillate; glumes firm, often scabrid, lanceolate-acute; lemma indurated, often scabrid
Deyeuxia
7. Rhachilla produced or not; if produced, other characters not associated:—
8. Glumes equal to or shorter than the lemma:—
9. Rhachilla not produced:—
10. Lemma hyaline, hairy below middle, long-awned
Muhlenbergia
10. Lemma indurated, longer than the glumes, unawned
Aulacolepis
9. Rhachilla shortly produced:—
11. Lemma long-awned from just below the tip
Apera
11. Lemma unawned
Aulacolepis
8. Glumes longer, often much longer than the lemma; rhachilla produced or not:—
12. Glumes lanceolate-acuminate, much longer than the lemma; callus-hairs longer than the lemma
Calamagrostis
12. Glumes lanceolate- or elliptic-acute; callus-hairs very short or absent
Agrostis

Agrostis Linn., Gen. Pl. ed. 5, 30 (1754) et in Sp. Pl. ed. 1, 61 (1753).

Vilfa Adans., Fam. 2, 495 (1763).

Trichodium Michx., Fl. Bor. Am. 1, 41 (1803), t. 8.

Agraulus P. Beauv., Ess. Agrost. 5 (1812), t. 4.

Key to the species and varieties of *Agrostis*

1. Lemmas not awned, glabrous (if hairy, see *A. munroana*):—
2. Palea absent or minute, less than one-half the length of the lemma:—
3. Panicle very dense, contracted, not more than 1 cm broad:—
4. Annual; lower glume 2 mm, the upper 1.75 mm long; anthers 0.4 mm long
A. inaequiglumis
4. Perennial; lower glume 2.5 mm, the upper 2.25 mm long; anthers 0.75 mm long
A. mackliniae
3. Panicle loose, often very loose, spreading:—
5. Branches and pedicels capillary; panicle very effuse with the habit of *Sporobolus*; glumes and lemma equal, 1.5 mm long; palea minute; anthers 0.5 mm long
A. brachiata

cc

5. Plants not as above:—
 6. Spikelets 1-1.2 mm long; glumes elliptic-acute, equal in length; anthers 0.4 mm long *A. himalayana*
 6. Spikelets over 1.5 mm long; glumes acute or acuminate, unequal in length (equal in *A. myriantha*); anthers over 0.4 mm long:—
 7. Leaves capillary; slender dwarf plants; spikelets 1.75 mm long; glumes unequal *A. sikkimensis*
 7. Leaves not capillary; narrow or often very broad:—
 8. Leaves narrow, not more than 3 mm broad:—
 9. Anthers less than 1 mm long:—
 10. Lower glume acuminate 2.5-3 mm long; upper glume 2-2.25 mm long; lemma 1.5-2.5 mm long; palea completely absent or minute; anthers 0.5 mm long *A. nervosa*
 10. Lower glume acute, not acuminate, 2 mm long; upper 1.75-2 mm long; lemma 1.5 mm long; palea at most equal to half the lemma, usually less; anthers 0.6 mm long *A. micrantha*
 9. Anthers 1-1.5 mm long *A. canina*
 8. Leaves over 5 mm and up to 1.1 cm broad; a very robust leafy species; anthers 0.5 mm long *A. myriantha*
2. Palea half as long as the lemma or longer:—
 11. Rhachilla produced:—
 - 11a. Glumes equal, acute; lemmas as long *A. zenkeri*
 - 11a. Glumes unequal, longer than the lemmas, the upper acuminate, the lower acute *A. nagensis*
 11. Rhachilla not produced:—
 12. Tips of the glumes subaristulate *A. subaristata*
 12. Tips of the glumes acute:—
 13. Panicle very dense; branches spiculate almost to the base, verticillate:—
 14. Rhizomes absent:—
 15. Lemma half the length of glumes or less; palea as long as lemma; anthers less than 0.75 mm long; no rhizomes *A. semiverticillata*
 15. Lemma two-thirds the length of the glumes; palea somewhat shorter; anthers about 1 mm long; rhizomes absent; stolons present *A. stolonifera* var. *stolonifera*
 14. Rhizomes present; palea one-half to two-thirds the lemma *A. tenuis*
 13. Panicles very effuse; branches bare at the base:—
 16. Rhizomes present; panicle open in fruit; ligule truncate, toothed *A. gigantea*
 16. Rhizomes absent; panicle closed in fruit; ligule obtuse *A. stolonifera* var. *stolonifera*

1. Lemmas awned:—
 17. Lemma glabrous:—
 18. Rhachilla produced, penicillate *A. triaristata*
 18. Rhachilla not produced:—
 19. Lemma with four setae from the truncate tip, awned from the base *A. wardii*
 19. Lemma without setae, awned from base or middle of lemma:—
 20. Palea longer than half the lemma:—
 21. Callus very shortly bearded; anthers 1–1.5 mm long; spikelets 3–3.5 mm long:—
 22. Awn basal *A. peninsularis*
 22. Awn median *A. tenuis*
 21. Callus bearded with hairs as long as the lemma; anthers small, 0.5 mm long; spikelets 4–5 mm long; awn dorsal *A. debilis*
 20. Palea less than half the length of the lemma or absent:—
 23. Awn median or above; anthers less than 1 mm long:—
 24. Glumes acute:—
 25. Glumes equal, about 2.5 mm long, acute; branches short, ascending; panicle very narrow, rather dense; anthers 0.75–0.8 mm long *A. filipes*
 25. Glumes unequal, the lower 3–4 mm long, acuminate; branches long-spreading, naked for half their length; panicle effuse and open; anthers 0.6–0.8 mm long *A. hookeriana* (*A. poluninii*)
 24. Glumes aristulate *A. subaristata*
 23. Awn basal to median; anthers 1–1.5 mm long; palea minute *A. canina*
 17. Lemma hairy:—
 26. Lemma hairy all over the dorsal surface:—
 27. Palea nearly as long as the lemma or at least longer than half the lemma:—
 28. Awn, if present, very short, not, or hardly, visible beyond the glumes; spikelets 1.75–3 mm long; anthers 0.7 mm long; tip of lemma toothed or truncate *A. munroana*
 28. Awn always exserted; spikelets 3–4 mm long; anthers over 1 mm long; tip of lemma truncate and 2-aristulate *A. griffithiana*
 27. Palea less than half the length of the lemma:—
 29. Plant with a woody rootstock; leaves contracted at the base into a rigid petiole *A. schmidii*
 29. Plants not as above:—
 30. Glumes 4.5–5.5 mm long, twice as long to more than twice the length of the lemma; spikelets purple *A. pilosula* var. *ciliata*
 30. Glumes at the most 4 mm long, often much less, at any

rate not twice the length of the lemma; anthers 0.8-1.25 mm long:—

31. Panicle very effuse; branches 6-10 cm long, bare in the lower half; spikelets green or greenish-yellow

A. pilosula var. *pilosula*

31. Panicle contracted or moderately spreading; branches very much shorter; spikelets greenish or purplish:—

32. Panicle more or less dense, interrupted; spikelets often purple

A. pilosula var. *royleana*

32. Panicle loose; branches 4-6 cm long:—

33. Leaves at the base filiform; spikelets green

A. pilosula var. *filifolia*

33. Leaves at the base not filiform, flat; spikelets purplish

A. pilosula var. *wallichiana*

26. Lemma glabrous on the dorsal surface, hairy at the sides

A. burmanica

1. *Agrostis brachiata* Munro ex Hook. f., Fl. Brit. Ind. 7, 256 (1896).

Distribution: Bihar; Monghyr.

In aspect this grass resembles no other species of *Agrostis* from India. It does, however, come very close to a species of *Agrostis* collected by Keng in Szechuan, China, to which he gave the manuscript name "megathyrsa" but the name does not seem to have been published. As Hooker remarks, it has the look of a *Sporobolus* rather than that of a species of *Agrostis*. The grains, however, are not enclosed in a mucilaginous envelope.

It also, at first sight, looks extremely like a species of P. Smirnov's genus *Zingeria* (Milieae) but differs from the species of that genus in the following respects: (1) the lemma is glabrous and not hirtellous; (2) the palea is only a fraction of the length of the lemma; and (3) the hilum is very small and is found at the base of the grain. It resembles *Zingeria* in (1) the extraordinary delicacy of the panicle; (2) the small 1-flowered spikelets; (3) the verticillate branching; and (4) the very small anthers. Exsicc.—Wallich 3769C, Bihar, Monghyr.

2. *Agrostis burmanica* Bor in Kew Bull. 1957, 416 (1958).

Distribution: Burma.

Exsicc.—Mt. Victoria, Kingdon-Ward 22816.

3. *Agrostis canina* Linn., Sp. Pl. ed. 1, 62 (1753).

Trichodium caninum (Linn.) Schrad., Fl. Germ. 1, 198 (1806).

Agraulus caninus (Linn.) P. Beauv., Ess. Agrost. 5 (1812), t. 4, f. 7.

Agrostis wightii Nees ex Steud., Syn. Pl. Glum. 1, 168 (1854).

Distribution: Temperate Asia (including the hills of tropical parts), Europe and North America.

Usually found in low-lying, damp situations, often locally abundant. $2n = 14$.

Exsicc.—N. L. Bor 16583, Lahul; J. F. Duthie 12660, Kashmir.

28. *Agrostis zenkeri* Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 6, 2, 363 (1841).

Deyeuxia abnormis Hook. f., Fl. Brit. Ind. 7, 268 (1896).

Agrostis abnormis Munro in Cat. Pl. Griffith, Falconer et Helfer, 57 (1865) nomen nudum.

A. pleiophylla Mez in Fedde, Rep. Sp. Nov. 17, 301 (1921).

Distribution: A slender grass widely dispersed in the hills of Assam and in Sikkim. One solitary collection comes from Madras.

Exsicc.—N. L. Bor 17927, Khasia; F. Kingdon-Ward 17882, Manipur; Hook. f. s.n., Sikkim.

Deyeuxia abnormis Hook. f. has been sunk in the synonymy of *Agrostis zenkeri* Trin. since the differences between the two are not sufficient, in my opinion, to separate them specifically.

Alopecurus Linn., Gen. Pl. ed. 5, 30 (1754) et in Sp. Pl. ed. 1, 60 (1753).

Colobachne P. Beauv., Ess. Agrost. 22 (1812), t. 6.

Tozzetia Savi in Mem. Soc. Ital. Sci. 8, 477 (1798).

Key to the species of *Alopecurus*

1. Awn very short or absent, much shorter than the lemma; spikelets 2.75–3 mm long; lemma projecting 0.5 mm beyond tip of glumes; glumes glabrous on sides *A. nepalensis*
1. Awn at least as long as the lemma:—
 2. Perennials; panicles broad, ovoid or oblong:—
 3. Panicle 2.5–3.5 cm long, silky; awn twice as long as the spikelet; glumes acuminate, hirsute with long hairs *A. himalaicus*
 3. Panicle 2.5–7 cm long, not silky; awn short; glumes lanceolate acute, long-ciliate on the keels only *A. arundinaceus*
 2. Annuals; panicles cylindrical:—
 4. Spikelets 4–6 mm long, almost glabrous on the sides of the glumes; glumes shortly ciliate on the keels below or all along; awn twice the length of the spikelet *A. myosuroides*
 4. Spikelets 2.5–3 mm long, hairy on the sides of the glumes; glumes ciliate at the base only:—
 5. Awn stout, twisted and kneed, about twice the length of the spikelet; anthers oblong in shape, violet, 2 mm long; spikelets 2.5–3 mm long *A. geniculatus*
 5. Awn slender, straight, very shortly visible or altogether imperceptible, the length of the spikelet or 0.5–0.8 mm longer; anthers minute, plump, 0.8–1 mm long, yellow; spikelets 2–2.5 mm long; plants glaucous *A. aequalis*
1. *Alopecurus aequalis* Sobol., Fl. Petrop. 16 (1799).
A. aristulatus Michx., Fl. Bor. Amer. 1, 43 (1803).

This species is somewhat similar to *A. myosuroides* but the spikelets are smaller and the awn is often absent or, if present, very small. It is found in damp places.

Exsicc.—*Wallich* 3780, Nepal; *Wingate* s.n., north-west India; *J. R. Drummond* 21210, Punjab.

Apera *Adans.*, Fam. Pl. 2, 495 (1763).

Anemagrostis *Trin.*, Fund. Agrost. 128 (1820).

1. *Apera interrupta* (Linn.) *P. Beauv.*, Ess. Agrost. 31 (1812).
Agrostis interrupta Linn., Syst. Nat. ed. 10, 2, 872 (1759).
Anemagrostis interrupta (Linn.) *Trin.*, Fund. Agrost. 129 (1820).
Muhlenbergia interrupta (Linn.) *Steud.*, Syn. Pl. Glum. 1, 177 (1854).

Agrostis interrupta (Linn.) *Bubani*, Fl. Pyr. 4, 289 (1901).

Distribution: Europe, extending to Afghanistan and probably in Baluchistan.

In waste places, generally on sandy soil. $2n = 14$.

Exsicc.—*Griffith* 6660, Afghanistan.

It is possible that *Apera intermedia* *Hack.* may also penetrate into north-west India. It differs from *A. interrupta* by having a glabrous callus and larger anthers (over 1 mm long against 0.3 mm in the above species). $2n = 14$.

Aulacolepis *Hack.* in Fedde, Rep. Sp. Nov. 3, 241 (1907).

1. *Aulacolepis treutleri* (O. Ktze.) *Hack.* in Fedde, Rep. Sp. Nov. 3, 242 (1907).

Deyeuxia treutleri (O. Ktze.) *Stapf* in Hook. f., Fl. Brit. Ind. 7, 269 (1896).

Milium treutleri O. Ktze., Rev. Gen. Pl. 2, 780 (1891) pro parte.

Distribution: North-east India, northern Burma and China.

Under *Milium* in *Ind. Kew. Suppl.* 7, 278 (1906) it is stated that *M. treutleri* O. Ktze., Rev. Gen. Pl. 780 (1891) is the same as *Cyathopus sikkimensis* *Stapf* and *Deyeuxia treutleri* *Stapf*, and reference is made to tab. 2395 and 2396 of Hook., Icon. Plantarum. *Stapf* definitely states in this place in obs. sub tab. 2395 that *Cyathopus* is very different from *Milium* and *Deyeuxia* and he repeats this sub tab. 2396 where he made the new combination *Deyeuxia treutleri*. Subsequently a new genus *Aulacolepis* was established by *Hackel*, based on this species and another from Japan. *Hackel* draws attention to the fact that his *Aulacolepis* has some of the characteristics of the genus *Poa* although he placed his genus in the *Agrostideae*.

Exsicc.—*F. Kingdon-Ward* 21568, Burma; *C. B. Clarke* 27428, Sikkim.

Calamagrostis Adans., Fam. Pl. 2, 31 (1763).

Amagris Rafin., Princ. Somiol. 27 (1814).

Pteropodium Willd. ex Steud., Nom. ed. 2, 2, 414 (1841),
nomen illegit.

Lechlera Steud., Syn. Pl. Glum. 1, 101 (1854) in nota.

Athernotus Dulac, Fl. Haut.-Pyr. 74 (1867).

Key to the species and varieties of *Calamagrostis*

1. Rhachilla not produced:—
 2. Awn of the lemma basal or median:—
 3. Glumes unequal, long-acuminate; lower 7–9, the upper 9–10 mm long
C. gigantea
 3. Glumes not very unequal, acute; lower and upper 5–7 mm long
C. epigejos
 2. Awn of the lemma terminal or subterminal:—
 4. Awn exserted; palea almost as long as the lemma or about 0.5 mm shorter
C. emodensis
 4. Awn included or very shortly exserted; palea half or three-quarters the length of the lemma
C. pseudophragmites
 5. Panicle very large, plume-like; leaves flat; spikelets light-coloured
C. pseudophragmites var. *pseudophragmites*
 5. Panicle strict, dense; leaves convolute; spikelets purplish
C. pseudophragmites var. *tartarica*
1. Rhachilla produced:—
 6. Rhachilla very short, quite glabrous or sometimes longer with a few hairs
C. garhwalensis
 6. Rhachilla penicillate:—
 7. Robust grass 1 m tall or more; awn of the lemma basal; anthers 2 mm long
C. decora
 7. Low grass up to 60 cm tall; awn of the lemma terminal; anthers 2.5 mm long; lemma ending in four aristulate lobes and the awn
C. stoliczkai

1. **Calamagrostis decora** Hook. f., Fl. Brit. Ind. 7, 260 (1896).

Distribution: Kashmir, endemic.

This species is represented at Kew by the type collection only, Astor, Kashmir (Type K). From the collector's note it seems to have been collected in a forest.

Exsicc.—J. F. Duthie 12660, Kashmir.

2. **Calamagrostis emodensis** Griseb. in Goett. Nachr. 80 (1868).

Distribution: This species seems to be endemic to the Himalaya, extending from Bhutan westwards to Kashmir.

It is a fine species with a very large plume-like panicle.

Exsicc.—J. F. Duthie 13472, Kashmir; J. F. Duthie 17, Tehri; Ribu et Rhomoo 5990, Sikkim.

This variety is distinguished by its very dense panicle of purple spikelets, the convolute leaves and low stature.

Exsicc.—*f. F. Duthie* 12184, Kashmir; *N. L. Bor* 16603, Lahul.

This variety was called *Calamagrostis tatarica* by Jacquemont in mss. It was transferred as a variety of *C. littorea* by Hook. f. and on each of the sheets so named by him in the Kew Herbarium the name is spelt "*tatarica*". When the varietal name was published in the *Flora of British India* 7, 261 (1896), the name was changed to "*tartarica*" and appears as such in the Index Kewensis.

7. *Calamagrostis stoliczkai* Hook. f., Fl. Brit. Ind. 7, 262 (1896).

Distribution: Western Tibet, penetrating to Zanskar.

A rather stout species with a strong rhizome.

Exsicc.—*Stoliczka* s.n., Zanskar; *Winterbottom* 825, Baltistan.

Deyeuxia Clar. in P. Beauv., Ess. Agrost. 43 (1812), t. 9, f.9.

Key to the species of *Deyeuxia*

1. Ligule about 25 mm long *D. simlensis*
1. Ligule not more than 10 mm long:—
 2. Glumes very hairy; inflorescence compact *D. tibetica*
 2. Glumes not hairy, at most scabrid:—
 3. Callus-hairs almost as long as the lemma:—
 4. Panicle dense with ascending branches; spikelets purplish; awn subbasal *D. kashmeriana*
 4. Panicle lax with spreading branches; spikelets glaucous, purple; awn supramedian *D. nepalensis*
 3. Callus-hairs not more than half the length of the lemma:—
 5. Inflorescence compact, greenish or pink; lemma awned below middle:—
 6. Spikelets greenish-pink, 4.5–5.5 mm long; glumes acute, glabrous *D. rosea*
 6. Spikelets greenish, 6–8.5 mm long; glumes acuminate, scabrid *D. munroi*
 5. Inflorescence loose, if compact, purplish:—
 7. Lemmas awned from the base:—
 8. Panicle very large, over 15 cm long, up to 45 cm long; congested or widely spreading:—
 9. Panicle with widely spreading branches *D. elatior*
 9. Panicle congested; branches ascending *D. arundinacea*
 8. Panicle not more than 6 cm long:—
 10. Panicle linear, often very narrow; anthers 0.5 mm long *D. nivicola*
 10. Panicle compact, congested or occasionally subeffuse; anthers 2.5–3.5 mm long *D. holciformis*

7. Lemmas awned from the middle of the dorsal surface or above this point:—

11. Awn inserted above the middle point; panicles usually congested; spikelets purplish; stout low grasses decumbent at the base to a woody rootstock *D. pulchella*

11. Awn median or sub-median:—

12. Rather weak grass with a loose, few-spiculate, widely spreading panicle; leaves flaccid, smooth, narrow

D. nagarum

12. Robust grass, erect from the base, tall, with fairly broad scabrid leaves; panicle congested with often very scabrid spikelets and branches *D. scabrescens*

1. ***Deyeuxia arundinacea*** (Linn.) P. Beauv., Ess. Agrost. 160 (1812).

Agrostis arundinacea Linn., Sp. Pl. ed. 1, 61 (1753).

Calamagrostis arundinacea (Linn.) Roth, Tent. Fl. Germ. 1, 33 (1788).

Arundo sylvatica Schrad., Fl. Germ. 1, 218 (1806).

Deyeuxia sylvatica (Schrad.) Kunth, Rév. Gram. 1, 77 (1829).

Distribution: Europe to the Caucasus and north-west India.

I can find no difference between the specimen collected by T. Thomson in Kunawar, and authentic specimens of this species from Europe.

Exsicc.—T. Thoms. s.n., Kunawar.

2. ***Deyeuxia elatior*** (Griseb.) Hook. f., Fl. Brit. Ind. 7, 266 (1896).

Calamagrostis scabrescens var. β *elatior* Griseb. in Goett. Nachr. 79 (1868).

Distribution: Endemic in the Khasi Hills, Assam.

This magnificent species, taller and more robust than any of the others, is common in the Shillong area, particularly in the neighbourhood of the Upper Shillong Farm.

Exsicc.—C. B. Clarke 40446, Khasia.

3. ***Deyeuxia holciformis*** (Jaub. et Spach) Bor, comb. nov.

Calamagrostis holciformis Jaub. et Spach, Ill. Pl. Orient. 4, 61 (1851), t. 340.

C. tianshanica Rupr. in Osten-Sacken et Rupr., Sert. Tianschan. 34 (1869) teste Flora U.S.S.R.

Deyeuxia compacta Munro ex Hook. f., Fl. Brit. Ind. 7, 267 (1896).

Calamagrostis compacta (Munro) Hack. ex Paulsen in Kjoeb. Vidensk. Meddel. 167 (1903).

Distribution: North-western Himalaya, Afghanistan.

Hook. f. wondered [Fl. Brit. Ind. 7, 367 (1896)] whether *Deyeuxia compacta* and the *Calamagrostis holciformis* of Jaubert et Spach were the same species. The type in Paris has been seen and there is no doubt that they are conspecific.

Exsicc.—N. L. Bor 15103 and 15440, Lahul; Jacquemont 1828, Western Tibet.

scabrid or very scabrid, large or small, the panicle somewhat dense or rather effuse.

The type of *D. scabrescens* seems to be the sheet collected by Hook. f. in Sikkim at Kankola, 13,000 ft, 22nd August 1849. This is Grisebach's var. α , *Goett. Nachr.* 79 (1868), with extremely scabrid glumes which are ciliate on the margins. The lemma also is very scabrid. Indeed the plant looks very different, but not, I should say, specifically, from the rest of the material collected at lower altitudes and further to the west in the Himalayas. Var. β *elator* Griseb. *loc. cit.* is a distinct species. As far as var. γ , *humilis*, is concerned one can say from an inspection of the rich material at Kew that there are smaller and more delicate specimens than the type of this variety and every gradation between the small and delicate to the large and robust.

Logically, in the present state of our knowledge, the Sikkim specimens should constitute var. *scabrescens* while one or more varieties based upon the divergence of the rest of the material from the type could be made. I hesitate to make varieties until this species has been studied by modern taxonomic methods.

Exsicc.—*N. L. Bor* 6409, Naga Hills; *R. R. Stewart* 9815, Kashmir.

12. *Deyeuxia simlensis* *Bor* in *Indian For. Rec.* n.s. 3, Bot. 149 (1941).
Distribution: Simla.

This species is distinguished by its extremely long ligule and lax panicle. It may, however, be only an extreme form of *D. scabrescens*, particularly as the only specimen known is the type collection.

Exsicc.—*D. M. Strong* s.n., Simla (Dehra Dun Herb.).

13. *Deyeuxia tibetica* *Bor* in *Kew Bull.* 1949, 66 (1949).

Distribution: North-east Sikkim.

The very compact ellipsoid panicle with very hairy glumes render the identification of this species easy.

Exsicc.—*Rhomoo Lepcha*, Chakalunga, 4800 m, Sikkim.

Hybrids

Calamagrostis \times *Deyeuxia*

A specimen, *N. L. Bor's collector* 628, collected at Karponang, may be a hybrid as the result of a cross between these two genera. The glumes are those of *Calamagrostis*. The lemma, however, is inclined to be firm and scabrid, the callus hairs are long and the rhachilla is produced and penicillate. The anthers are poorly developed.

Lagurus *Linn.*, *Sp. Pl.* ed. 1, 81 (1753) et in *Gen. Pl.*
ed. 5, 34 (1754).

1. *Lagurus ovatus* *Linn.*, *Sp. Pl.* ed. 1, 81 (1753).

Distribution: Mediterranean Region, but it has been introduced into many countries as an ornamental grass.

Exsicc.—*Dharm Pal Bhandari*, Pahlgam, Kashmir. This record is very likely that of a specimen which has escaped from cultivation. $2n = 14$.

***Muhlenbergia* Schreb., Gen. 44 (1789).**

Clomena P. Beauv., Ess. Agrost. 28 (1812), t. 7, f. 10.

Trichochloa P. Beauv., Ess. Agrost. 29 (1812), t. 8, f. 2.

Podosaeum Kunth in Mém. Mus. Paris 2, 72 (1815).

Dactylogramma Link, Hort. Berol. 2, 248 (1827).

Diplachyrium Nees in Flora 9, 303 (1828).

Calycodon Nutt. in J. Acad. Nat. Sci. Philad. n.s. 1, 186 (1847).

Vaseya Thurb. in Proc. Acad. Nat. Sci. Philad. 79 (1863).

Key to the species of *Muhlenbergia*

1. Panicle of congested racemes of unawned spikelets; rhizomes present, short, curved *M. mexicana*
1. Panicle of congested or very loose racemes of awned spikelets; curved rhizomes not present:—
 2. Spikelets congested in the raceme; glumes very attenuate almost awned; tips often recurved *M. duthieana*
 2. Spikelets spaced on the racemes; if rather congested, lemma much longer than the glumes; glumes acute to acuminate at the tips:—
 3. Lemma twice as long as the glumes *M. huegelii*
 3. Lemma as long as, or slightly longer than, the glumes *M. himalayensis*

1. ***Muhlenbergia duthieana* Hack.** in Öst. Bot. Z. 52, 11 (1902).
M. sylvatica of Hook. f., Fl. Brit. Ind. 7, 259 (1896) non Torr. (1834).

Distribution: Himalaya above 2000 m.

A forest grass, possibly of some use as fodder.

Exsicc.—*J. F. Duthie* 7610, Sambalpat (iso-type, K); *J. F. Duthie* 10129, Simla.

2. ***Muhlenbergia himalayensis* Hack. ex Hook. f., Fl. Brit. Ind. 7, 259 (1896).**

Distribution: North-western Himalaya from Kumaon westwards above 2000 m. Also in Western Ghats.

A grass of moist shady places. It may be of use as a fodder.

Exsicc.—*N. L. Bor* 16649, Lahul; *J. F. Duthie* 314, Jumna Valley; *Meebold* 9134, Khandala.

3. ***Muhlenbergia huegelii* Trin.** in Mém. Acad. Sci. Pétersb., sér. 6, 6 (2), 293 (1841).

M. viridissima Nees ex Steud., Syn. Pl. Glum. 1, 178 (1854).

M. geniculata Nees ex Steud., loc. cit. 178.

Distribution: In the hills of North and north-east India from 1000 to 3000 m (extending to China) where it is often locally common in shade. $2n = 42$.

Exsicc.—R. R. Stewart 23317, Murree Hills; N. L. Bor's collector 650, Sikkim; Hook. f. et T. Thoms. s.n., Khasia.

4. **Muhlenbergia mexicana** (Linn.) Trin., Gram. Unifl. 189 (1824).
Agrostis mexicana Linn., Mant. Pl. 1, 31 (1767).
A. tenacissima Linn. f., Suppl. 107 (1781).
Vilfa mexicana (Linn.) P. Beauv., Ess. Agrost. 16, 148, 181 (1812).
Trichochloa mexicana (Linn.) Trin., Fund. Agrost. 117 (1820).
Podosaemum mexicanum (Linn.) Link, Hort. Berol. 1, 84 (1827).

Distribution: United States, escaped from cultivation and found at Kaulagarh, Dehra Dun. Very conspicuous on account of the anchor-shaped rhizomes which make it a good soil-binder. $2n = 40$.

Phleum Linn., Gen. Pl. ed. 5, 29 (1754) et in Sp. Pl. ed. 1, 59 (1753).

Key to the species of *Phleum*

1. Perennials:—
 2. Panicle not more than four times as long as broad, very rarely longer; awns equal in length to the glumes *Ph. alpinum*
 2. Panicle over four times as long as broad; awns about one-third as long as the glumes *Ph. pratense*
1. Annuals:—
 3. Glumes lanceolate, finely acuminate, hardly awned; keels with cilia spaced above *Ph. himalaicum*
 3. Glumes cuneately obovate-truncate, cuspidate; keels scabrid *Ph. paniculatum*

1. **Phleum alpinum** Linn., Sp. Pl. ed. 1, 59 (1753).
Ph. commutatum Gaud. in Alpina 3, 4 (1808).

Distribution: This species is cosmopolitan, occurring as it does in the Arctic regions and on the mountains of the Northern Hemisphere, penetrating to the south of Chile, along the mountain chains of the New World.

The Central European plant, referred to *Ph. alpinum* Linn., is a diploid ($2n = 14$) while the widespread Arctic and mountain plant of the Old World, sometimes called *Ph. commutatum*, is a tetraploid ($2n = 28$).

Exsicc.—Inayat 20345, Kashmir; J. F. Duthie 6189, Kumaon.

2. **Phleum himalaicum** Mez in Fedde, Rep. Sp. Nov. 17, 293 (1921).
P. arenarium of the Fl. Brit. Ind. 7, 237 (1896) non Linn. (1753).
P. arenarium var. *thomsonii* Griseb. in Goett. Nachr. 83 (1868).

Distribution: North-west India in the hills above 1500 m.

Exsicc.—J. S. Gamble 23069, Jaunsar; J. F. Duthie s.n., Chitral. $2n = 14$.

3. **Phleum paniculatum** Huds., Fl. Angl. 23 (1762).
P. asperum Jacq., Coll. 1, 110 (1786).

Distribution: North-western India, westwards to the Mediterranean.
 Exsicc.—N. L. Bor 14063, Monali; S. M. Toppin 208, Chitral.

4. **Phleum pratense** Linn., Sp. Pl. ed. 1, 59 (1753).

Distribution: Originally confined to temperate Europe, but now introduced into most countries, including India. It is commonly known as "Timothy". It is an important fodder grass. $2n = 42$.

Polypogon Desf., Fl. Atlant. 1, 66 (1798).

Nowodworskya J. S. Presl ex C. B. Presl, Rel.
 Haenk. 1, 351 (1830).

Key to the species of *Polypogon*

1. Awns 5–9.75 mm long, 2–3 times the length of the glumes

P. monspeliensis

1. Awns 1.25–3.75 mm long, as long as or shorter than the glumes

P. fugax

1. **Polypogon fugax** Nees ex Steud., Syn. Pl. Glum. 1, 184 (1854).

P. higagaweri Steud., loc. cit. 422 (1855).

Distribution: Found all along the Himalaya and in the Naga Hills above 1500 m.

It is a true hill grass growing in damp and swampy places, and is not found in the plains. It is of some use as a fodder. $2n = 42$.

Exsicc.—R. R. Stewart 10129, Rawalpindi; C. W. D. Kermode 17314, Tangtung, Burma; Griffith 2699, Bhutan; Meebold 6872, Naga Hills.

- ✓ 2. **Polypogon monspeliensis** (Linn.) Desf., Fl. Atlant. 1, 67 (1798).

Alopecurus monspeliensis Linn., Sp. Pl. ed. 1, 61 (1753).

Phleum crinitum Schreb., Besch. Graes. 1, 151 (1769).

Agrostis alopecuroides Lamk., Tabl. Encycl. Meth. Bot. 1, 160 (1791).

Phleum monspeliense (Linn.) Koel., Descr. Gram. 57 (1802).

Polypogon flavescens J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 234 (1830).

Santia monspeliensis (Linn.) Parl., Fl. Palerm. 1, 73 (1845).

Distribution: Widespread in Europe and in the temperate parts of Asia and Africa—introduced into many countries. It is usually found in the cooler parts of the north-west Himalaya, Madras and Ceylon, but has also been collected in Sind. In moist places it can become very lush and affords rich feeding for grazing animals. $2n = 28$.

Exsicc.—J. F. Duthie 22924, North-west Himalaya; J. S. Gamble 22721, Dehra Dun; Thwaites C.P. 144, Ceylon.

POOIDEAE—ARISTIDEAE

ARISTIDEAE C. E. Hubb. in C. E. Hubb. et Vaughan, Grass. Maur. 20 (1940) in clavi (anglice) et in hujus libri Appendice p. 685

Spikelets all alike, hermaphrodite, 1-flowered; rhachilla disarticulating above the glumes, not produced beyond the floret. Glumes usually persistent, scarious, 1-3-nerved, equal or unequal, rarely the lower longer than the upper, sometimes awned, usually muticous or mucronate; lemma convolute or involute, at first chartaceous, becoming firmer, cylindric, faintly 3-nerved, entire or 2-fid at the tip, with a bearded pungent or rarely forked callus, awned; palea small, oblong, hyaline, 2-nerved; awn nearly always 3-partite from the base or above the base, jointed to the tip or to a column or continuous with the lemma; column straight or twisted; bristles plumose or the lateral or all naked. Lodicules 2. Stamens 3 or 1. Ovary glabrous; styles distinct, short; stigmas plumose, laterally exerted. Grain slender, terete or oblong-terete, tightly embraced by the lemma; hilum linear, almost as long as the grain; embryo short or long; starch grains compound.

Annual or more often tufted perennial herbs. Leaf-blades narrow, often convolute, with panicoid anatomy; silica-cells dumb-bell-shaped or oblong; micro-hairs, when present, 1-celled, rarely 2-celled, and then elongate, slender; ligule a fringe of hairs. Spikelets pedicelled in effuse or contracted panicles.

Chromosomes small; basic number 11 or 12.

Genus: *Aristida*.

Stipagrostis

see added 1973 sep. ed. *Aristida* Linn., Gen. Pl. ed. 5, 35 (1754) et in Sp. Pl. ed. 1, 82 (1753).
Kiebohl Adans., Fam. Pl. 2, 31 (1763).

Chaetaria P. Beauv., Ess. Agrost. 30 (1812), t. 8, f. 5, 6.

Curtopogon P. Beauv., loc. cit. t. 8, f. 7.

Arthratherum P. Beauv., loc. cit. t. 8, f. 8.

Streptachne H.B.K., Nov. Gen. et Sp. 1, 124 (1816), t. 40.

Trixostis Rafin. in Ser. Bull. Bot. 1, 221 (1830).

Moulinsia Rafin., loc. cit.

Stipagrostis Nees in Linnaea 7, 290 (1832).

Schistachne Fig. et de Not. in Mem. Acad. Torin, sér. 2, 12, 252 (1852).

Key to the species and varieties of *Aristida*

1. There is no articulation between the lemma and the awns either at its tip or at the top of a prolongation (column):—
2. Lateral awns much reduced and of a different texture from the third awn, sometimes absent altogether; glumes subequal; lemma about 4 mm long, chartaceous, passing into the rather coriaceous swollen twisted column
A. redacta

2. Lateral awns well developed, if shorter than the central awn, of the same texture:—
3. A small annual 5–10 cm tall (up to 20 cm in robust specimens); lower glume 2.5 mm, upper glume 3 mm long; lemma 1.5 mm long; awns unequal, central 5 mm long *A. cumingiana*
3. Annuals or perennials, much larger in all their parts:—
4. Panicles contracted:—
5. Glumes long-awned, with awns 3–5 mm long; lower glume up to 17 mm long; upper glume up to 20 mm long, both inclusive of awns; sheaths long, open at ramifications, coriaceous-crustaceous, shiny, polished, yellow or chrome-yellow *A. setacea*
5. Glumes not long-awned; awns at most 2 mm long:—
6. Glumes unequal; the lower up to 6 mm long, not over two-thirds the length of the upper, which is 8.5–9 mm long; lemma shorter than the upper glume, about 8–8.5 mm long; awns of glumes 2 mm long; annual *A. depressa*
6. Glumes not very unequal; the lower more than two-thirds the length of the upper; glumes not awned but upper emarginate with a very short mucro between the lobes:—
7. Lemma not or not much longer than the upper glume; erect plants; lower glume 5–8 mm long; upper glume 6–9 mm long; lemma about 10 mm long *A. adscensionis* var. *adscensionis*
7. Lemma much longer than the upper glume, up to 12 mm long; lower glume 6 mm long; upper glume 8 mm long; dwarf plants *A. adscensionis* var. *pumila*
4. Panicles effuse, often as broad as long:—
8. Spikelets green or yellowish at maturity; lower glume 12 mm long with an awn 2 mm long; upper glume 18 mm long, shortly awned; lemma (with a callus 2 mm long) about 12 mm long; panicle 20 cm long *A. hystrix*
8. Spikelets mostly purplish at maturity; lower glume 15 mm long; upper glume up to 20 mm long, inclusive of an awn 5 mm long; lemma (with densely hairy callus 1 mm long) up to 15 mm long; panicle 30–40 cm long, widely spreading *A. cyanantha*
1. There is an articulation between the lemma and the awns whether it be at the tip or centre of the lemma or at the top of a prolongation:—
9. Central awn always feathery at least in its upper part:—
10. Side awns glabrous:—
11. Lowest sheaths covered with a thick flocculent wool; glumes unequal, the lower 15 mm long, sub-3-nerved, upper up to 18 mm long, 1-nerved; lemma 4–5 mm long; callus 2 mm long, long-hairy; leaves rolled, filiform, pungent, often curved,

- sometimes forming a semi-circle or complete circle; central awn 5-7 cm long
A. plumosa
11. Lowest sheaths not lanate:—
12. Lemma tuberculate-scabrid all over; glumes hirsute or pilose all over or glabrous at the tips only; lateral awns naked, of extreme tenuity; column about 8 mm long, bearded below the trifurcation; central awn with an excurrent naked tip
A. hirtigluma
12. Lemma tuberculate or papillose-scabrid in the upper part only or smooth; glumes glabrous:—
13. Central awn plumose throughout:—
14. Column about 8 mm long, strongly twisted, long-bearded above and below the knee; glumes nearly equal, lower 9-10 mm long, upper 12 mm long; lemma 4-5 mm long; callus-hairs 2-3 mm long; culms several-noded
A. pogonoptila
14. Column about 16 mm long, twisted, not long-bearded above and below the knee; lower glume acuminate 15 mm long, longer than the acute upper (13 mm); lemma 4-5 mm long
A. paradisea
13. Central awn plumose in upper half, naked below:—
15. Glumes 9-10 mm long, chartaceous, yellow with a purple base; lemma 5 mm long, articulated at the middle; prolongation of lemma 7 mm long, hollow at base, not twisted, glabrous; leaves pungent, glaucous
A. ciliata
15. Glumes 7-9 mm long, membranous, yellow or purplish; column 7 mm long, not hollow at base, glabrous; lemma 3 mm long; leaves filiform, circinate
A. obtusa
10. All the awns plumose:—
16. Lower sheaths lanate; central awn 4 cm long, much longer than the side awns
A. griffithii
16. Lower sheaths glabrous; central awn 10 mm long, about as long as the side awns
A. pungens
9. Central awn not feathery:—
17. The articulation between the awns and the lemma is situated at the top of the column, i.e. just below the spreading awns
A. mutabilis
17. The articulation is between the tip of the lemma and the base of the column:—
18. Lower glume always longer than the upper; base of the callus pointed:—
19. Column of the awns less than 2 cm long; no long white hairs on pedicels or in axils; lower glume 14-15 mm long; upper glume 14-16 mm long; lemma 4-5 mm long
A. royleana
19. Column of the awns longer than 2 cm:—

20. Glumes extraordinarily unequal; lower glume 25–28 mm, the upper 6 mm long; column covered with short white hairs *A. stocksii*
20. Glumes not so unequal, the upper about three-quarters the length of the lower or nearly equal; lower glume 20 mm, the upper 15–19 mm long; long white sparse hairs often present in axils and on pedicels and also on the leaves at the base *A. funiculata*
21. Column about 4.5 cm long; central awn up to 5 cm long, the two lateral 4–4.5 cm long var. *funiculata*
21. Column about 2 cm long; central and lateral awns 3–3.5 cm long var. *mallica*
18. Lower glume shorter than the upper:—
22. Callus forked at the base; a dwarf plant *A. hystricula*
22. Callus sharp at the tip and curved; plants 20–45 cm tall; inflorescence dense *A. triticoides*
- ✓1. ***Aristida adscensionis* Linn., Sp. Pl. ed. 1, 82 (1753).**
 var. ***adscensionis*.**
A. interrupta Cavan., Ic. et Descr. Pl. 5, 45 (1799), t. 471, f. 2.
A. canariensis Willd., Enum. Pl. Berol. 99 (1809).
Chaetaria adscensionis (Linn.) P. Beauv., Ess. Agrost. 30, 151, 158 (1812).
Aristida divaricata Jacq., Eclog. Gram. Rar. 7 (1813), t. 6.
A. coarctata H.B.K., Nov. Gen. et Sp. 1, 122 (1816).
A. bromoides H.B.K., loc. cit. 122.
Chaetaria bromoides (H.B.K.) Roem. et Schult., Syst. Veg. 2, 396 (1817).
Aristida fasciculata Torr. in Ann. Lyc. Nat. Hist. 1, 154 (1824).
Chaetaria fasciculata (Torr.) Schult., Syst. Veg. 2, Mant. Addit., 1, 578 (1827).
Aristida nigrescens J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 223 (1830).
A. vulgaris Trin. et Rupr., Sp. Gram. Stip. 131 (1842) et in Mém. Acad. Sci. Pétersb. sér. 6, 7, 131 (1843).
A. mongholica Trin. et Rupr. loc. cit. 133.
A. curvata Nees var. *abyssinica* A. Rich., Tent. Fl. Abyss. 2, 392 (1851).
A. mauritiana Hochst. ex A. Rich., loc. cit. 392.
A. maritima Steud., Syn. Pl. Glum. 1, 137 (1854).
A. nana Steud., loc. cit. 137.
A. teneriffae Steud., loc. cit. 420.
A. modatica Steud., loc. cit. 139.
A. schaffneri Fourn., Mex. Pl. 2, 78 (1886).
A. grisebachiana Fourn., loc. cit. 78.
A. heymannii Regel in Act. Hort. Petrop. 7, 649 (1881).
A. debilis Mez in Fedde, Rep. Sp. Nov. 17, 151 (1921).



Fig. 43. *Aristida adscensionis* Linn.
 1, plant $\times \frac{1}{2}$; 2, spikelet from side $\times 4$; 3, lower glume; 4, upper glume; 5, lemma;
 6, stamens, ovary and lodicules; all $\times 6$.

POOIDEAE—ARUNDINEAE

ARUNDINEAE Dumort., Obs. Gram. Belg. 82, 124 (1823) as *Arundinaceae*.

Spikelets 2-10-flowered, somewhat laterally compressed, hermaphrodite or unisexual, dioecious; rhachilla disarticulating above the glumes and between the florets, sometimes penicillate with long white hairs; florets all male or all hermaphrodite or the lowest male or barren in a few genera. Glumes hyaline or membranous, acuminate, persistent; lemmas somewhat similar to the glumes, 1-3-nerved, acuminate, awnless or awned from the tip, often bearing long white hairs from the back or sides or lowest quite glabrous; palea short, linear-oblong, 2-keeled. Lodicules 2 or 3, 2-3-nerved, obovate, glabrous. Stamens 2 or 3. Ovary glabrous; styles 2; stigmas 2, plumose. Caryopsis loosely enclosed by lemma and palea, oblong, terete; hilum oblong, short, basal. Starch grains compound.

Perennial reeds. Leaf-blades broad, long, often auriculate, with usually panicoid anatomy; silica-cells cross-shaped; hairs 2-celled, long, narrow; ligule a row of stiff hairs. Spikelets pedicelled, arranged in large plumose panicles.

Chromosomes small; basic number 12.

Genera: *Arundo*

Cortaderia

Phragmites

Key to the genera of *Arundineae*

1. Plants dioecious; leaves crowded at the base of the stems **Cortaderia**
1. Plants not dioecious; spikelets hermaphrodite; leaves distributed along the culms:—
 2. Lemmas glabrous; rhachilla long-villous **Phragmites**
 2. Lemmas hairy all over the back; rhachilla glabrous **Arundo**

Arundo Linn., Gen. Pl. ed. 5, 35 (1754) et in
Sp. Pl. 81 (1753).

- ✓ 1. **Arundo donax** Linn., Sp. Pl. ed. 1, 81 (1753).
Arundo sativa Lamk., Fl. Franç. 3, 616 (1778).
A. bifaria Retz., Obs. Bot. 4, 21 (1786).
A. latifolia Salisb., Prodr. Stirp. 24 (1796).
Donax arundinaceus P. Beauv., Ess. Agrost. 78, 152, 161 (1812).
Scolochloa arundinacea Mert. et Koch ex Roehl., Deutsch. Fl. ed. 3, 1, 530 (1823).
Cynodon donax (Linn.) Raspail in Ann. Sci. Nat. Bot. 5, 302 (1825).
Scolochloa donax (Linn.) Gaudin, Fl. Helvet. 1, 202 (1828).
Donax donax Aschers. et Graebn., Fl. Nordostd. Flachl. 101 (1898).
Arundo glauca Bubani, Fl. Pyr. 4, 303 (1901) non Bieb. (1808).

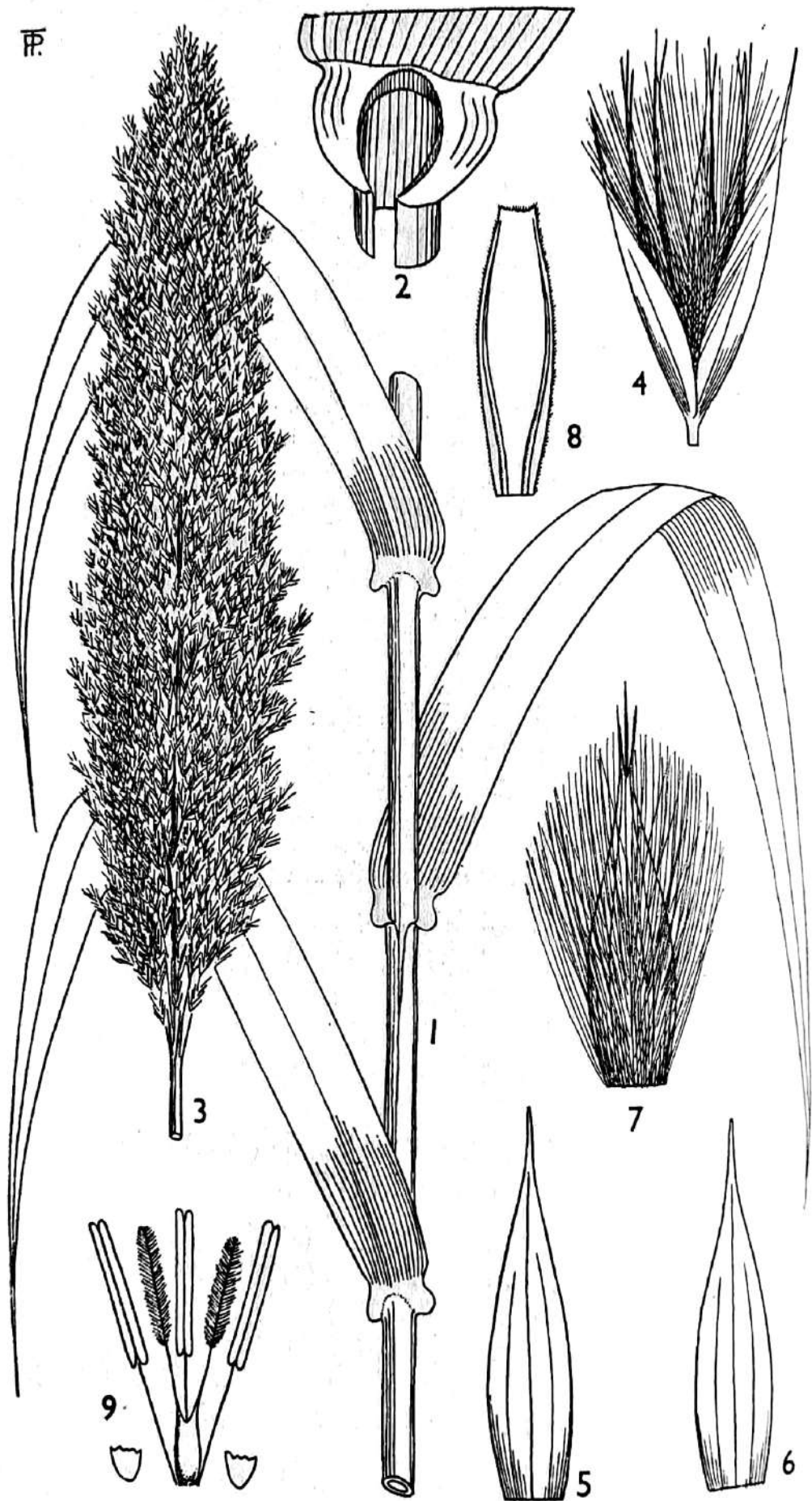


Fig. 44. *Arundo donax* Linn.

1, portion of stem $\times \frac{1}{4}$; 2, ligule $\times 1$; 3, inflorescence $\times \frac{1}{4}$; 4, spikelet; 5, upper glume; 6, lower glume; 7, lemma, all $\times 4$; 8, palea $\times 6$; 9, flower and lodicules $\times 6$.

Distribution: Tropical Asia and Mediterranean Region, introduced into the New World.

This stout reed will grow in dryish habitats when established, but it prefers plenty of moisture. As a fodder grass it is not of much account, but cattle will browse upon the young leaves. When cut back or constantly nibbled it branches and in this way can be grown as a fence. The dried stems when crushed can be woven into rough mats for walls and roofs. The hollow stems are also used to make herdsmen's pipes. This grass has been planted in Texas as a protection against wind erosion. A variety with leaves striped with white, known as var. *versicolor* (Miller) Stokes, is sometimes cultivated for ornament. $2n = 100, 110$.

Exsicc.—J. S. Gamble 22383, Dehra Dun; Bourne 2725, Madras; A. A. Bullock 836, Manipur; N. L. Bor 6728, Naga Hills; S. Kurz 2761, Burma; Wallich 5020, Nepal.

Cortaderia Stapf in Gard. Chron. sér. 3, 22, pt. 2,
396 (1897) nomen genericum conservandum.

Moorea Lemaire, Ill. Hort. 2, Misc. 15 (1854) in obs.

1. **Cortaderia selloana** (Schult.) Aschers. et Graebn., Syn. Mitteleur. Fl. 2, 325 (1900).

Arundo dioeca Spreng., Syst. Veg. 1, 361 (1825) non *A. dioeca* Lour. (1793).

A. selloana Schult., Syst. Veg. 2, Mant. addit. 1, 605 (1827).

Gynerium argenteum Nees, Agrost. Bras. 462 (1829).

Cortaderia argentea (Nees) Stapf in Gard. Chron. 22, 396 (1897).

C. dioica Speg., An. Mus. Nac. Buenos Aires 7, 194 (1902).

Distribution: A native of the hills and plains of South America, but it has been introduced into many countries, including India, as an ornamental grass. $2n = 72, 67$.

Phragmites Trin., Fund. Agrost. 134 (1820).

Czernya Presl, Cyp. et Gram. Sicul. 22 (1820).

Oxyanthe Steud., Syn. Pl. Glum. 1, 197 (1854).

Key to the species and varieties of *Phragmites*

1. Lowest lemma 15–17 mm long; joints of the rhachilla 0.6 mm long; ligule up to 1.5 mm long *Ph. communis*
2. Leaves flat, 10–30 mm wide, ending in a long filiform point; sheaths much longer than 10 cm; leaves flat var. *communis*
2. Leaves less than 10 mm wide, rolled, stiff, almost to quite pungent at the tip; sheaths very short, c. 3 cm long var. *stenophylla*
1. Lowest lemma 9–13 mm long; joints of the rhachilla 0.8 mm long; ligule not more than 0.5 mm long *Ph. karka*
3. Pedicels of the spikelets glabrous var. *karka*
3. Pedicels of the spikelets hairy var. *cincta*

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POOIDEAE—ARUNDINELLEAE

ARUNDINELLEAE *Stapf* in *Dyer*, *Fl. Cap.* 7, 314 (1898)

Spikelets all alike, 2-flowered, with the lower floret male or barren and the upper hermaphrodite; rachilla disarticulating between the florets. Glumes persistent, unequal, the lower smaller, usually acute, the upper acuminate, membranous to coriaceous; lower lemma persistent, similar in texture to the upper glume, 3–9-nerved; (palea absent?) upper lemma more or less terete, smaller than the lower, firmer in texture, awnless or with a very short bristle or more often awned from the minutely 2-lobed tip, rarely accompanied by two bristles, one on either side at the tip; awn kneed and twisted below the knee; palea delicate, 2-keeled. Lodicules 2, cuneate. Stamens 3. Ovary glabrous with 2 distinct styles and plumose stigmas. Grain oblong or ellipsoid, tightly embraced by lemma and palea; hilum punctiform or linear; embryo about half the length of the grain; starch-grains compound.

present
see Fl. Pak

Annual or perennial herbs. Leaf-blades linear to lanceolate, frequently large, usually flat, with panicoid anatomy; silica-cells quadrate, cross-shaped or dumb-bell-shaped; micro-hairs 1- or 2-celled; ligules very short, membranous or ciliate. Inflorescence of pedicelled spikelets often paired, arranged in large, effuse or contracted panicles.

Chromosomes small; basic number 7.

Genera: *Arundinella*
Danthoniopsis
Jansenella

Key to the genera of **Arundinelleae**

1. Lemma of the upper floret glabrous, usually scaberulous or scabrid; minutely 2-lobed at the apex with the lobes produced into short capillary bristles or not, awned between the lobes or awnless

Arundinella

1. Lemma of the upper floret deeply bifid, bearded on the dorsal surface:—
 2. Ligule a narrow arched membrane; upper lemma with a dense beard on each side below the lobes and about the middle; lobes produced into slender bristles; hilum punctiform

Jansenella

2. Ligule a row of hairs; upper lemma with a dense row of hairs across the back or the row of hairs in several bundles; lobes acuminate not produced into scabrid bristles; hilum linear

Danthoniopsis

Arundinella *Raddi*, *Agrost. Bras.* 36 (1823), t. 1.

Goldbachia *Trin.* in *Spreng.*, *Neue Entdeck.* 2, 81 (1821) non *DC.* (1821).

Calamochloe *Reichb.*, *Consp.* 52 (1828).

Brandtia Kunth, Rév. Gram. 2, 511 (1831), t. 170.

Thysanachne Presl, Sym. Bot. 1, 11 (1829), t. 6.

Riedelia Trin. ex Kunth, Enum. Pl. 1, 515 (1833).

Acratherum Link, Hort. Berol. 1, 230 (1827).

Key to the species and varieties of *Arundinella*

1. Inflorescence cylindric, very densely spicate, 7.5–10 mm wide, 2–5 cm long; plant looks superficially like a *Setaria* *A. spicata*
1. Inflorescence not at all spicate, either a dense panicle of racemes of spikelets or in ample or contracted panicles:—
 2. Upper lemma with two setae, one on each side of the awn, at the tip:—
 3. Perennials:—
 4. Spikelets usually loose, distinctly pedicelled, 4.5–7.5 mm long, usually, but not always, supported by stiff setae at the tip of the pedicel:—
 5. Base glabrous; spikelets 6.5–7.5 mm long *A. setosa* var. *setosa*
 5. Base woolly; spikelets 4.5–5.5 mm long *A. setosa* var. *lanifera*
 4. Spikelets crowded, subsessile or very shortly pedicelled in a panicle made up of short crowded spicate racemes:—
 6. Culms stout, very densely bearded at the nodes; spikelets 6–8 mm long; upper lemma 3–4 mm long; panicle at least 15 cm long, reaching 50 cm long *A. khaseana*
 6. Culms slender, glabrous or very slightly pubescent at the nodes; spikelets 4–5 mm long; upper lemma 2 mm long; panicle 4–12 cm long *A. mesophylla*
 3. Annuals:—
 7. Whole plant covered with tubercle-based hairs; spikelets long, acuminate, 7.5–9.5 mm long *A. tuberculata*
 7. Plants not entirely covered with tubercle-based hairs; spikelets at most 5–6 mm long, similar in appearance to those of *A. setosa* and often supported by bristles at the tip of the pedicel, but upper glume even more acuminate; size of panicle very variable *A. nervosa*
 2. Upper lemma with a single awn or the awn absent:—
 8. Plants woolly at the base; spikelets awned:—
 9. Panicle of short racemes (3 cm long or less) of crowded spikelets 7.5 mm long, short-pedicelled, covered with tubercle-based bristles *A. villosa*
 9. Panicle spreading, of long slender branches up to 12 cm long; spikelets 4.5–5.5 mm long, long-pedicelled, few, distant *A. setosa* var. *lanifera*
 8. Plants not woolly at the base though the sheaths may be hirsute or the basal buds silky:—
 10. Upper lemma not awned or if so, awn not more than 2 mm long; base of upper lemma naked:—

11. Spikelets 4–7.5 mm long; tips of the pedicels with stiff setae; basal buds silky *A. setosa* var. *lanifera*
11. Spikelets 2.5–3.5 mm long; tips of the pedicels devoid of setae; basal buds glabrous:—
12. Panicle very large, 30–70 cm long by 15–20 cm wide; branches long, undivided, 8–20 cm long; very stout grass *A. decempedalis*
12. Panicle very much smaller; culms not more than 3 mm thick below the panicle:—
13. Leaves conspicuously cordate or rounded at the base:—
14. Panicle of very numerous branches bearing densely crowded spikelets; spikelets 2.5 mm long; leaves 45 cm long, 3–4 cm wide, coriaceous, glabrous; peduncle glabrous below the panicle *A. leptochloa* or sparsely hairy
14. Panicle rather open, of few branches and more or less distant pairs of spikelets, never dense; spikelets 3–3.5 mm long; leaves 25 cm long, 2–2.5 cm wide, chartaceous, with a fringe of bulbous-based hairs along the margins; peduncle below the panicle with spaced tubercle-based hairs *A. blephariphylla*
13. Leaves narrowed at the base or slightly rounded:—
15. Panicle cylindrical; branches up to 5 cm long, usually 2–3 cm long, covered with densely crowded, secund spikelets with hispidulous glumes; occasionally an awn present, not more than 2 mm long *A. bengalensis*
15. Panicle not as above:—
16. Spikelets solitary on the branches, shorter than the pedicels; panicle-axis and branches quite glabrous *A. thwaitesii*
16. Spikelets binate on the branches; branches and axis of panicle scabrid, pilose at junction of branch and axis; spikelets 2.25–3.75 mm long; stout plants with large dull purple panicles or slender with greenish panicles *A. leptochloa*
10. Upper lemma bearing a geniculate awn:—
17. Spikelets small, not more than 2 mm long; upper lemma 1 mm long; leaf-blades elliptic-acuminate, membranous to chartaceous, 3–25 cm long, 5–25 mm wide; inflorescence a very effuse panicle 10–30 cm long with many spikelets *A. pumila*
17. Spikelets well over 2 mm long; leaves not as above:—
18. Spikelets glabrous or with a few short hairs on the keels of the glumes:—
19. Perennial grasses:—
20. Panicle 10–45 cm long, usually very effuse; axis smooth and glabrous:—

GRASSES OF INDIA, BURMA AND CEYLON

- 20a. Spikelets less than 5 mm long:—
21. Panicle 10–15 cm long; pedicels much longer than the spikelets *A. laxiflora*
21. Panicle 10–45 cm long; pedicels shorter than the spikelets or not much longer *A. nepalensis*
- 20a. Spikelets over 5 mm long; pedicels with stout bristles, short or up to 1 cm long; lower lemma subcoriaceous *A. setosa* var. *esetosa*
20. Panicle usually contracted; axis very scabrid or markedly ciliate:—
22. Leaves rounded at the base or subcordate, usually collected at the base of the plant, drying yellowish-green; sheaths and leaf-margins with tubercle-based hairs:—
23. Pedicels short; panicle compact *A. purpurea* var. *purpurea*
23. Pedicels very long; panicle effuse; spikelets sometimes proliferous *A. purpurea* var. *pedicellata*
22. Leaves linear-acuminate, not rounded at the base *A. intricata*
19. Annual grasses:—
24. Pedicels of the spikelets less than 5 mm long; panicles up to 50 cm long; spikelets 3.5–4.5 mm long; glumes with conspicuous green nerves, glabrous or with a few, or many, bristles, or a few cilia on the back of the upper glume or occasionally rough from the tubercle-bases of the fallen bristles *A. metzii*
24. Pedicels much longer, up to 16 mm long; panicle not more than 6 cm long; glumes scabrous on the nerves, otherwise smooth and glabrous *A. laxiflora*
18. Spikelets very bristly from tubercle-based hairs on the nerves of the glumes and/or on the interspaces, or at least the bases of the bristles remaining:—
25. Spikelets 6–7 mm long, densely crowded on the short branches of the panicle; perennials:—
26. Peduncle hairy below the inflorescence; basal sheaths very long, crowded at the base of the culm *A. vaginata*
26. Peduncle glabrous below the inflorescence; basal sheaths much shorter *A. hookeri*
25. Spikelets up to 5 mm long; annuals:—
27. Panicle up to 50 cm long, very effuse and drooping; with long branches; spikelets 3–4 mm long; glumes unequal *A. metzii*

27. Panicle usually compact, if rather effuse then with the glumes more or less equal:—
28. Lower glume considerably exceeding the lower lemma in the spikelet; glumes very densely covered in the lower half with tubercle-based bristles
A. ciliata
28. Lower glume aristulate, a little shorter than, equal to or slightly exceeding the lower lemma in the spikelet:—
29. Leaves rounded at the base; spikelets 4.5–5 mm long
A. birmanica
29. Leaves not rounded at the base; spikelets 3.5 mm long
A. holcoides

1. ***Arundinella bengalensis*** (Spreng.) Druce in Rep. Bot. Exchng. Club, Brit. Isles, 605 (1916).

Panicum bengalense Spreng., Syst. Veg. 1, 311 (1825).

Arundinella wallichii Nees ex Steud., Syn. Pl. Glum. 1, 114 (1854).

Panicum strictum Roxb., Fl. Ind. 1, 306 (1820) non R.Br. (1810) nec Pursh. (1814) nec Bosc ex Roem. et Schult. (1817).

Arundinella stricta (Roxb.) Janowski in Fedde, Rep. Sp. Nov. 17, 84 (1921).

Distribution: South-east Asia.

Exsicc.—Kingdon-Ward 20100, Assam; C. B. Clarke 35801, Calcutta, Bengal; J. F. Duthie 2456, Dehra; C. B. Clarke 20768, Parasnath, Bihar; J. H. Lace 4242, Burma.

2. ***Arundinella blephariphylla*** (Trim.) Trim. ex Hook. f., Fl. Brit. Ind. 7, 77 (1896).

Panicum blephariphyllum Trim. in J. Bot. 22, 272 (1885).

Distribution: This species is endemic in Ceylon.

Exsicc.—Trimen s.n., Ceylon.

3. ***Arundinella birmanica*** Hook. f., Fl. Brit. Ind. 7, 73 (1896).

Distribution: Burma.

This species is very close to *A. holcoides* but it is a more robust grass, the spikelets are longer and the panicle stiffer and more dense.

Exsicc.—Griffith s.n., Moulmein; Kurz 3161, Rangoon.

✓ 4. ***Arundinella ciliata*** (Roxb.) Nees ex Miq. in Verh. Konink. Nederl. Inst. 3, pt. 4, 30 (1851).

Holcus ciliatus Roxb., Fl. Ind. 1, 321 (1820).

Arundinella pilosa Hochst. ex Miq. in Verh. Konink. Nederl. Inst. 3, pt. 4, 30 (1851).

A. agrostoides Hook. f., Fl. Brit. Ind. 7, 71 (1896) non Trin. (1836).

A. hirsuta Nees ex Steud., Syn. Pl. Glum. 1, 115 (1854) non Hochst.

Distribution: Madras State, endemic.

- ✓ 23. *Arundinella villosa* Arn. ex Steud., Syn. Pl. Glum. 1, 115 (1854).

A. villosa Arn. ex Steud. var. *wightii* Hook. f., Fl. Brit. Ind. 7, 73 (1896).

Distribution: Ceylon, endemic.

Exsicc.—*F. Ballard* 1404, Corbett's Gap; *F. Ballard* 1223, below Hakgala.

(*Arundinella anomala*) Steud., Syn. Pl. Glum. 1, 116 (1854).

Agrostis ciliata Thunb., Fl. Jap. 49 (1784) non *Arundinella ciliata* Nees (1851).

A. thunbergii Steud., loc. cit. 163.

Panicum mandschuricum Maxim., Mém. Acad. Sci. Pétersb. 9, 328 (1859).

P. williamsii Hance in Ann. Sci. Nat. Bot. sér. 5, 5, 250 (1866).

Arundinella hirta Tanaka var. *ciliata* Koidz. in Bot. Mag. Tokyo 39, 303 (1925).

This is a Chinese and Japanese species which may turn up in Eastern Assam. It is similar to *A. bengalensis* in appearance but the panicle is looser and the upper lemma long-bearded at the base.

Danthoniopsis Stapf. in Hook., Icon. Pl. (1916), t. 3075.

1. **Danthoniopsis stocksii** (Boiss.) C. E. Hubb. in Hill, Fl. Trop. Afr. 10, 76 (1937).

Tristachya stocksii Boiss., Fl. Or. 5, 552 (1884).

T. barbata Hook. f., Fl. Brit. Ind. 7, 272 (1896) non Nees ex Steud. (1854).

Distribution: Sind and Baluchistan, endemic.

This plant is described in the *Flora of British India* as perennial, but none of the specimens in Herb. Kew. shows the base, so that a recent specimen collected by Father Santapau, which showed this part of the plant, was welcome. The rhizome is sufficiently remarkable as to merit a short description.

The rhizome is thick and woody, villous with silky hairs, sending out rootlets along its length, covered with overlapping distichous scales which are short at the base and about 1 cm long near the tip, ending in a sharp mucro. The sterile shoots have short overlapping sheaths, each supporting a triangular limb or reduced leaf, which is very firm and ends in a pungent point. It is obviously a valuable sand-binder.

Exsicc.—*Elliot* s.n., Baluchistan; *Stocks* 453, 648, Sind.

Jansenella Bor in Kew Bull. 1955, 96 (1955).

- ✓ **Jansenella griffithiana** (C. Muell.) Bor in Kew Bull. 1955, 98 (1955).

Danthonia griffithiana C. Muell. in Bot. Z. 14, 347 (1856).

Arundinella avenacea Munro ex Thw., Enum. Pl. Zeyl. 362 (1864).

A. hirta

see addenda
1973

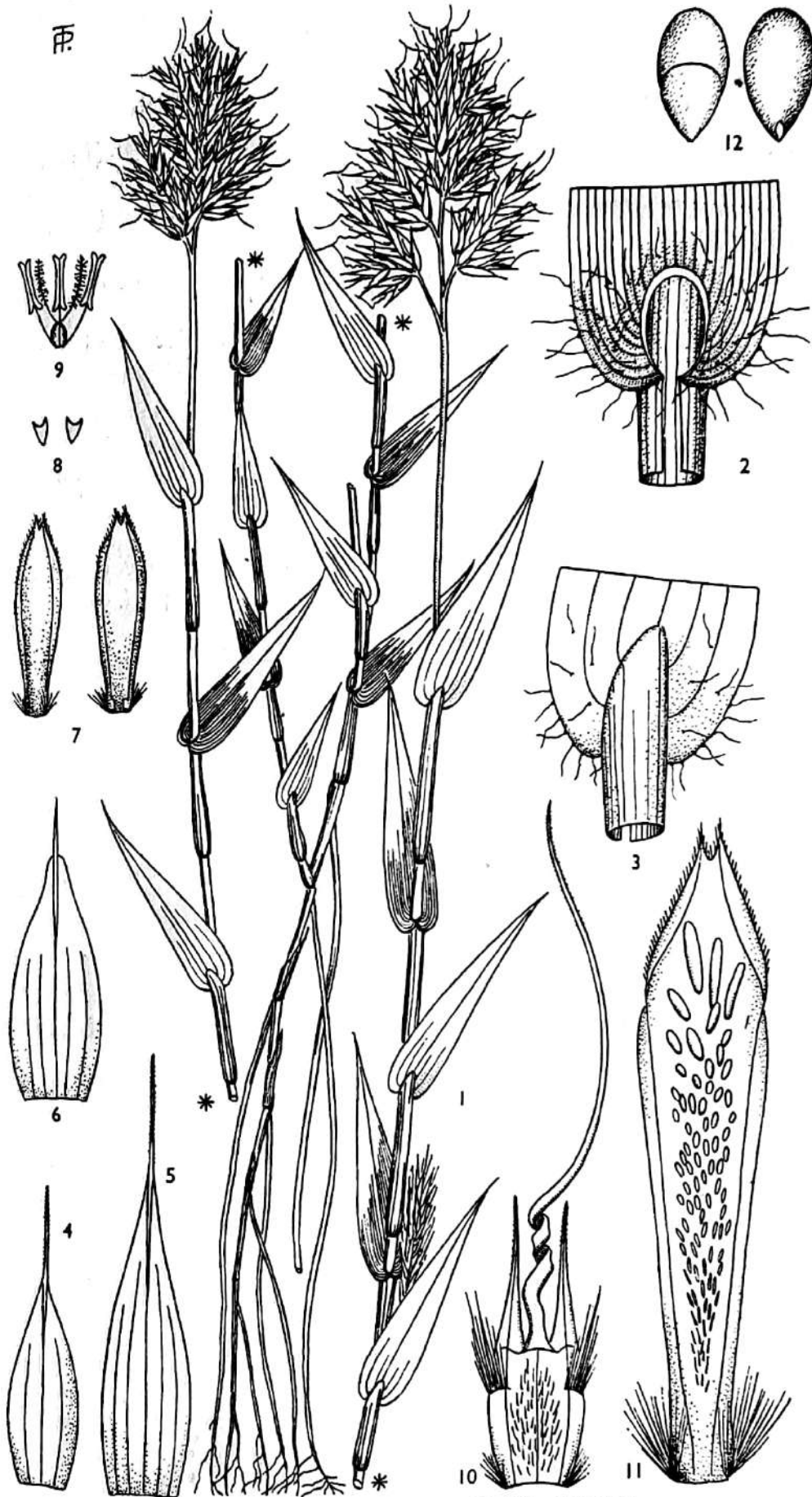


Fig. 45. *Jansenella griffithiana* (C. Muell.) Bor
 1, plant $\times 1$; base of leaf showing the arch-shaped ligule $\times 6$; 3, abaxial view showing mode of attachment of leaf $\times 6$; 4, lower glume $\times 8$; 5, upper glume $\times 8$; 6, lower lemma $\times 8$; 7, lower palea, adaxial and abaxial views $\times 8$; 8, lodicules $\times 8$; 9, flower $\times 8$; 10, upper lemma $\times 8$; 11, upper palea, adaxial surface $\times 30$; 12, grain showing embryo and hilum $\times 15$.

A. campbelliana Lisboa in J. Bombay Nat. Hist. Soc. 5, 346 (1891).

Avena malabarica Heyne ex Hook. f., Fl. Brit. Ind. 7, 69 (1896) nomen.

Arundinella griffithiana (C. Muell.) Bor in Indian For. Rec. (Bot.) 1, 3, 73 (1938).

Danthoniopsis griffithiana (C. Muell.) Bor in Fl. Assam 5, 187 (1940).

Distribution: Assam, Bombay, Madras, Ceylon.

This grass favours moist hollows, the low banks of rivers and swampy fields. It is to be found in the hills between 1000 and 2000 m and grazing animals are fond of it. In Bombay it has been found in open places in rather dry habitats, and here the parts of the spikelets become almost coriaceous and the glumes more or less long-awned. The facies of such plants is somewhat different from that of typical *Jansenella griffithiana*, but I doubt if they are specifically distinct.

Exsicc.—*Griffith* 6785, Khasia; *W. A. Talbot* 2255, North Kanara; *J. S. Gamble* 15449, Wynaad; *Thwaites* C.P. 3471, Ceylon; *S. Kurz* s.n., Burma.

POOIDEAE—AVENEAE

AVENEAE Dumort., Obs. Gram. Belg. 82, 120 (1823) as *Avenaceae*

Spikelets all alike, 2–7-flowered, more or less laterally compressed, with all the florets hermaphrodite or the uppermost often barren, rarely one or both of the two lowest florets male or neuter; rhachilla disarticulating above the glumes and nearly always between the florets as well; callus often bearded. Glumes persistent, mostly equal, usually as long as the lowest lemma and often as long as the spikelet and enclosing the florets, membranous to chartaceous, frequently with shining margins; lemmas membranous to cartilaginous in texture, 5- to several-nerved, hyaline or scarious and shining on the margins, entire or 2-lobed at the tip, usually awned from the back or from between the lobes, rarely awnless; awn consisting usually of a twisted column and a bristle, kneed, rarely straight, scabrid; palea as long as the lemma or slightly longer, hyaline, 2-keeled. Lodicules 2. Stamens 3, 2 or 1. Styles 2 or 1. Grain often tightly clasped by the lemma and palea; hilum linear, long; embryo up to one-third the length of the grain; starch-grains compound.

Annual or perennial herbs. Leaf-blades narrow, with festucoid anatomy; silica-cells oblong or elliptic; no 2-celled hairs; ligules well developed, membranous. Spikelets pedicelled and arranged in open or contracted panicles.

Chromosomes large; basic number 4, 5, 7.

<i>Genera:</i>	<i>Aira</i>	<i>Hierochloe</i>
	<i>Anthoxanthum</i>	<i>Holcus</i>
	<i>Arrhenatherum</i>	<i>Koeleria</i>
	<i>Avena</i>	<i>Lophochloa</i>
	<i>Deschampsia</i>	<i>Pseudodanthonia</i>
	<i>Duthiea</i>	<i>Trisetum</i>
	<i>Helictotrichon</i>	

Key to the genera of **Aveneae**

1. Glumes chartaceous, golden-brown, unequal, 5–9-nerved, with a few cross nerves, longer than the lemmas; styles 3, each with a long stigma
Pseudodanthonia
1. Above characters not associated; styles 2 or 1:—
 2. Lower floret male or neuter:—
 3. Lower pair of florets barren or both male or the lower male and the other barren; hermaphrodite floret not awned:—
 4. Spikelets lanceolate; plants smelling strongly of coumarin; lodicules absent; lower florets empty
Anthoxanthum
 4. Spikelets strongly compressed, not lanceolate, urn-shaped, faintly odoriferous; lodicules present

3. Lowest floret male, the other hermaphrodite, both awned

Arrhenatherum

2. Lowest florets bisexual, the succeeding similar or reduced:—

5. Spikelets 1- to several-flowered; rhachilla produced:—

6. Lemmas awned from between two lobes of the lemma; style very long single

Duthiea

6. Lemmas awnless or awned from the back:—

7. Ovary hairy above or all over; awns mostly twisted at the base; spikelets over 8 mm long:—

8. Spikelets nodding; annuals; glumes 7-11-nerved

Avena

8. Spikelets erect; perennials; glumes 1-7-nerved

Helictotrichon

7. Ovary glabrous; awns not twisted at the base; spikelets less than 8 mm long:—

9. Lemmas finely erose-dentate or lobed, awned dorsally; spikelets 2- rarely 3-flowered

Deschampsia

9. Lemmas cleft or 2-toothed or 2-lobed with lobes sometimes prolonged into an awn; rhachilla of spikelet pubescent or ciliate:—

10. Perennials:—

- 10a. Panicles spiciform, silvery; lemmas awnless or with a minute bristle

Koeleria

- 10a. Panicles effuse; lemmas with a perfect awn

Trisetum

10. Annuals:—

Lophochloa

5. Spikelets strictly 2-flowered; rhachilla not produced:—

11. Spikelets falling entire at maturity, strongly laterally compressed; lower lemma awnless; upper lemma awned, usually male

Holcus

11. Spikelets breaking up at maturity leaving the glumes persistent

Aira

Aira Linn., Gen. Pl. ed. 5, 31 (1754) et in Sp. Pl. ed. 1, 63 (1753).

Aspris Adans., Fam. 2, 496 (1763).

Fiorinia Parl., Fl. Ital. 1, 232 (1848).

Fussia Schur, Enum. Pl. Transs. 754 (1866).

- ✓ 1. **Aira caryophyllea Linn.**, Sp. Pl. ed. 1, 66 (1753).
Distribution: Europe, Western Asia, North Africa, introduced into North and South America, and also into India. $2n = 14$. A related species *A. elegans* Willd. is sometimes cultivated in gardens. It is a plant native in the Mediterranean Region and is a much more delicate and graceful plant than *A. caryophyllea*.

Anthoxanthum Linn., Gen. Pl. ed. 5, 17 (1754) et in
Sp. Pl. ed. 1, 28 (1753).

Key to the species of *Anthoxanthum*

1. Awns of the spikelets projecting 2 mm or less beyond the tip of the spikelets *A. odoratum*
1. Awns projecting much more than 2 mm beyond the tip of the spikelet:—
 2. Spikelets 6–8.5 mm long:—
 3. Lower glume about half as long as the upper glume; panicles rather loose; leaves up to 4 mm broad *A. hookeri*
 3. Lower glume more than half as long as the upper glume; panicles somewhat to very congested; leaves up to 10 mm broad:—
 4. Leaves linear-lanceolate, up to 10 mm broad; spikelets 6.5 mm long, on short hairy pedicels; second lemma awned from the back, 5 mm long; third lemma 3 mm long *A. sp.*
 4. Leaves linear, narrow, up to 5 mm broad; spikelets 5.5 mm long on glabrous pedicels; second lemma 5.5 mm long; third lemma 3.5 mm long *A. clarkei*
 2. Spikelets less than 5 mm long; spikelets congested into a dense weak panicle *A. sikkimense*

1. **Anthoxanthum clarkei** (Hook. f.) Ohwi in Bull. Tokyo Sci. Mus. 18, 8 (1947).

Hierochloe clarkei Hook. f., Fl. Brit. Ind. 7, 223 (1896).

Distribution: Khasia, Burma.

Exsicc.—C. B. Clarke 45553, Khasia; F. Kingdon-Ward 22789, Burma.

2. **Anthoxanthum hookeri** (Griseb.) Rendle in J. Linn. Soc. (Bot.) 36, 380 (1904). Also Mez in Fedde, Rep. Sp. Nov. 17, 291 (1921).

Ataxia hookeri Griseb. in Goett. Nachr. 77 (1868).

Hierochloe hookeri Maxim. in Bull. Acad. Sci. Pétersb. 32, 627 (1888).

H. hookeri (Griseb.) Clarke ex Hook. f., Fl. Brit. Ind. 7, 223 (1896).

Distribution: Eastern Himalaya above 2500 m.

Exsicc.—B. J. Gould 1278A, Bhutan; Rohmoo Lepcha s.n., Sikkim.

3. **Anthoxanthum odoratum** Linn., Sp. Pl. ed. 1, 28 (1753).

Distribution: Widespread in Europe extending to temperate Asia.

This has been introduced into India in seed mixtures for pasturage or hay. It gives a very fragrant odour to hay, but is not very acceptable to stock. $2n = 20$.

Exsicc.—R. N. Parker 3270, Kulu; J. S. Gamble 22807, Chakrata; C. B. Clarke 44093, Khasia.

4. **Anthoxanthum sikkimense** (Maxim.) Ohwi in Bull. Tokyo Sci. Mus. 18, 8 (1947).

Hierochloe sikkimensis Maxim. in Bull. Acad. Sci. Pétersb. 32, 626 (1888).

Anthoxanthum Linn., Gen. Pl. ed. 5, 17 (1754) et in
Sp. Pl. ed. 1, 28 (1753).

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1. Awns of the spikelets projecting 2 mm or less beyond the tip of the spikelets *A. odoratum*
1. Awns projecting much more than 2 mm beyond the tip of the spikelet:—
 2. Spikelets 6–8.5 mm long:—
 3. Lower glume about half as long as the upper glume; panicles rather loose; leaves up to 4 mm broad *A. hookeri*
 3. Lower glume more than half as long as the upper glume; panicles somewhat to very congested; leaves up to 10 mm broad:—
 4. Leaves linear-lanceolate, up to 10 mm broad; spikelets 6.5 mm long, on short hairy pedicels; second lemma awned from the back, 5 mm long; third lemma 3 mm long *A. sp.*
 4. Leaves linear, narrow, up to 5 mm broad; spikelets 5.5 mm long on glabrous pedicels; second lemma 5.5 mm long; third lemma 3.5 mm long *A. clarkei*
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Hierochloe clarkei Hook. f., Fl. Brit. Ind. 7, 223 (1896).

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Ataxia hookeri Griseb. in Goett. Nachr. 77 (1868).

Hierochloe hookeri Maxim. in Bull. Acad. Sci. Pétersb. 32, 627 (1888).

H. hookeri (Griseb.) Clarke ex Hook. f., Fl. Brit. Ind. 7, 223 (1896).

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Exsicc.—R. N. Parker 3270, Kulu; J. S. Gamble 22807, Chakrata; C. B. Clarke 44093, Khasia.

4. ***Anthoxanthum sikkimense*** (Maxim.) Ohwi in Bull. Tokyo Sci. Mus. 18, 8 (1947).

Hierochloe sikkimensis Maxim. in Bull. Acad. Sci. Pétersb. 32, 626 (1888).

H. gracillima Hook. f., Fl. Brit. Ind. 7, 223 (1896).

Anthoxanthum gracillimum (Hook. f.) Mez in Fedde, Rep. Sp. Nov. 17, 291 (1921).

Distribution: Sikkim above 3000 m.

Exsicc.—Hook. f. (1 Ataxia), Lachoong, Sikkim.

5. *Anthoxanthum* sp.

This species may be distinct. It is very close to *Anthoxanthum clarkei* from the Khasi and Naga Hills. The latter, however, is represented in the Kew Herbarium by two collections only, and one lacks the base of the plant. The other specimen from the Naga Hills shows a small part of the rhizome only, this organ being quite remarkable in the Nilgiri plant, and it is not certain whether the two are identical. It is for this reason not being described as new.

Exsicc.—Bourne 3136, Pulneys.

Arrhenatherum P. Beauv., Ess. Agrost. 55 (1812) tab. 11, f.5.

1. *Arrhenatherum elatius* (Linn.) J. S. et C. B. Presl, Fl. Čechica 17 (1819); Mert. et Koch, Deutsch. Fl. 1, 546 (1823).

Avena elatior Linn., Sp. Pl. ed. 1, 79 (1753).

Holcus avenaceus Scop., Fl. Carn. ed. 2, 276 (1772).

Avena elata Salisb., Prodr. Stirp. 23 (1796).

Arrhenatherum avenaceum (Scop.) P. Beauv., Ess. Agrost. 55 (1812), t. 11, f.5.

Distribution: Europe and Western Asia. Introduced into many other countries.

A very leafy species, deep-rooted, which is more suitable for hay as it will not stand heavy grazing (Hubbard). $2n = 28$. This plant is a rather coarse grass and according to Hubbard is drought resistant. On this account it should be of value in temperate dry situations. The variety, var. *bulbosum*, which has a swollen base, has not yet been detected in India.

Avena Linn., Gen. Pl. ed. 5, 34 (1754) et in Sp. Pl. ed. 1, 79 (1753).

Key to the species and varieties of *Avena*

1. Lemmas with two fine awns from the tip in addition to the dorsal awn, glabrous or hairy:—
 2. All the florets articulate with the rhachis and eventually fall away easily; lemmas pilose *A. barbata*
 2. All the florets continuous with the rhachis, finally falling after fracture of the latter *A. strigosa*
1. Lemmas without two apical awns or bristles:—

3. Lemmas densely bearded at the base, awned, often hairy all over except towards the apex; rhachilla readily disarticulating between upper glume and lowest floret; lowest lemma with a thickened smooth oblique callus at the base:—
 4. Rhachilla readily disarticulating between all the florets at maturity; all lemmas with a thickened callus at the base; spikelets up to 29 mm long:—
 5. Glumes 27.5–30 mm long; lemma up to 25 mm long
A. meridionalis
 5. Glumes 20–25 (26) mm long; lemma up to 20 mm long
A. fatua
 6. Lemmas loosely to densely hairy above the base:—
 7. Lemmas densely hairy all over except at the apex, dark brown at maturity
A. fatua var. *fatua*
 7. Lemmas, especially the lowest, sparsely hairy on the back up to the awn, turning olive-grey or greyish-brown at maturity
A. fatua var. *pilosa*
 6. Lemmas glabrous, usually yellowish at maturity; callus short-bearded
A. fatua var. *glabrata*
 4. Rhachilla continuous and tough between the florets; lowest lemma only with a thickened callus:—
 8. Spikelets 19–30 mm long; lowest floret 16–25 mm long:—
 9. Lemmas hairy
A. ludoviciana
 9. Lemmas glabrous
A. sativa × *sterilis*
 8. Spikelets 30–52 mm long; lowest floret 25–40 mm long
A. sterilis
 3. Lemmas glabrous or only with a few hairs at the base of the lowest floret; rhachilla not disarticulating but breaking with an irregular fracture; no lip-like scar at the base of the lemma:—
 10. Lowest floret breaking from the rhachilla with an almost horizontal fracture; spikelets 17–28 mm long
A. sativa
 10. Lowest floret breaking from the rhachilla with an oblique (about 45 degrees) fracture; spikelets 23–36 mm long
A. byzantina
1. ***Avena barbata*** Pott ex Link in Schrader, J. für Bot. 2, 315 (1799).
A. hirsuta Moench, Meth. Pl. Suppl. 64 (1802).
Distribution: Europe to South Russia, north-west India, South Africa.
Brotero [in *Fl. Lusit.* 1, 108 (1804)] is sometimes quoted as the author of this name on the ground that the description in Link, loc. cit., is inadequate. Link, however, does mention the hairy lemma and, incidentally, the specimen was seen by Nevski. $2n = 28$.
Exsicc.—*T. Thoms.* 1038, Kumaon.
 2. ***Avena byzantina*** C. Koch in Linnaea 21, 392 (1848).
A. sterilis Linn. subsp. *byzantina* (C. Koch) Thell. in Vierteljschrft. Nat. Ges. Zürich 56, Heft 3, 316 (1911).
Distribution: Europe to India and South Africa.

8. *Avena strigosa* Schreb., Spicil. Fl. Lips. 52 (1771).

Distribution: Widespread in Europe but has not so far been recorded from India.

This species is cultivated in Europe on poor soils and it is also a weed in cornfields. It is possible therefore that it may be introduced accidentally into India and one must be prepared for its appearance. $2n = 14, 28$.

9. *Avena sativa* × *sterilis*.

Distribution: Pusa.

This hybrid was raised in Pusa. The lemmas are glabrous except for a few hairs at the base which has the rounded scar of the *sterilis* parent. $2n = 42$.

Deschampsia P. Beauv., Ess. Agrost. 91 (1812), tab. 18, fig. 3.

Campella Link, Hort. Berol. 1, 122 (1827).

Avenella Parl., Fl. Ital. 1, 244 (1848).

Czerniaevia Turcz. ex Ledeb., Flor. Ross. 4, 422 (1853).

Airidium Steud., Syn. Pl. Glum. 1, 423 (1855).

Rytidosperma Steud., loc. cit. 425.

Key to the species of *Deschampsia*

1. Panicle spreading:—

2. Leaves bristle-like, 0.2–0.8 mm wide

D. flexuosa

2. Leaves flat or unrolled, 2–5 mm wide

D. caespitosa

1. Panicle dense ellipsoid or ovoid

D. koelerioides

1. *Deschampsia caespitosa* (Linn.) P. Beauv., Ess. Agrost. 91, 160 (1812).

Aira caespitosa Linn. Sp. Pl. ed. 1, 64 (1753).

Agrostis caespitosa (Linn.) Salisb., Prodr. Stirp. 25 (1796).

Distribution: Widely distributed in temperate and Arctic regions, also in the mountainous regions of Africa and Asia.

Exsicc.—R. R. Stewart 22176, Kashmir; Dr. Bor's collector 658, Sikkim;

J. F. Duthie 13710, Baltistan. $2n = 26$ (28).

2. *Deschampsia flexuosa* (Linn.) Trin. in Bull. Acad. Sci. Pétersb. 1, 66 (1836).

Aira flexuosa Linn., Sp. Pl. ed. 1, 65 (1753).

Avena flexuosa (Linn.) Mert. et Koch in Roehl., Deutsch. Fl. ed. 3, 1, 570 (1823).

Avenella flexuosa (Linn.) Parl., Fl. Ital. 1, 246 (1848).

Distribution: Widespread in Europe, extending to the mountains of Asia and introduced elsewhere.

Exsicc.—Polunin, Sykes and Williams 5057, Nepal. $2n = 28$.

3. *Deschampsia koelerioides* Regel in Bull. Soc. Nat. Mosc. 41, 299 (1868).

Distribution: North-western Himalaya, Turkestan.

A distinct looking plant found at altitudes of about 4500 m.
 Exsicc.—*Alcock* 17780, Pamirs; *C. B. Clarke* 30529, Baltistan; *J. F. Duthie* 13935, Kashmir.

Duthiea Hack. in Verh. Zool.-Bot. Ges.
 Wien, 45, 200 (1895).

Thrixgyne Keng in Sunyatsenia 6, 80 (1941), t. 13.

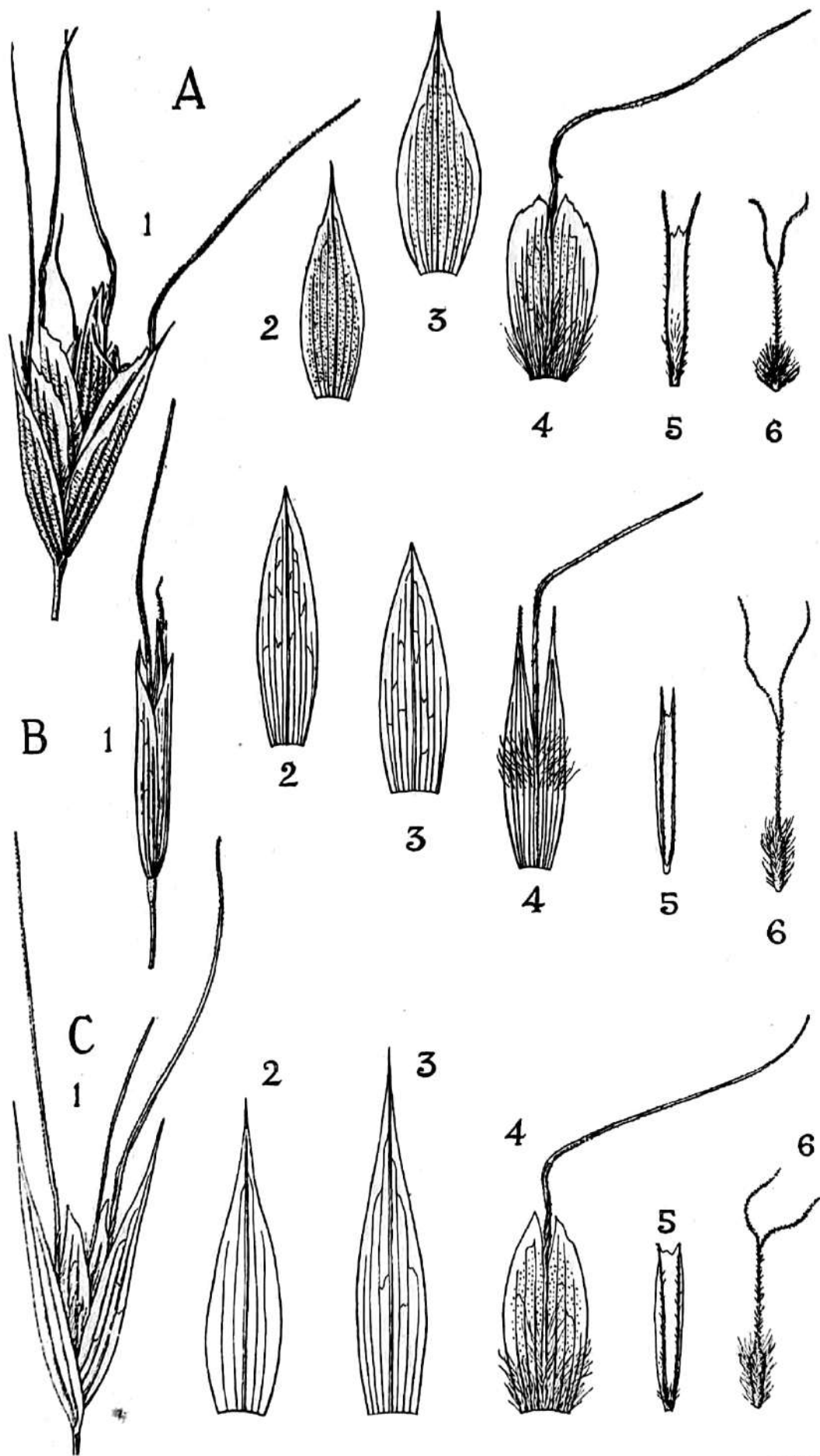
Key to the species of *Duthiea*

1. Inflorescence an erect, cylindrical raceme, about 7 cm long, 8–11-spiculate, hardly exerted from the uppermost sheath; spikelets cylindrical, 1-flowered; lemma cleft into two narrow acute lobes, villous in the middle third *D. nepalensis*
1. Inflorescence not cylindrical, nodding, 3–9-spiculate, well exerted from the uppermost sheath; spikelets cylindrical or turgid, cuneate, 2–3-flowered; lemmas rounded, somewhat apiculate at the apex, hairy in lower half:—
 2. Culms scabrid below the inflorescence; glumes dull, minutely scabrid; lemma villous in the lower quarter; palea 2-aristulate *D. bromoides*
 2. Culms glabrous; glumes very smooth, shining; lemma covered with long, white appressed bristles in lower half; palea not aristulate *D. oligostachya*
1. *Duthiea nepalensis* Bor in Kew Bull. 1953, 550 (1954).
 Distribution: Nepal.

This species is known from the type collection only, which is preserved in the British Museum. It was collected by *O. Polunin* at Langisa Karka, Central Nepal. It is apparently found on grassy slopes, a different habitat from that of its two congeners.

My colleague, *C. E. Hubbard*, has drawn my attention to the genus *Thrixgyne*—a new genus of grasses established by Keng in *Sunyatsenia* 6, 80 (1941), t. 13. The structure of the spikelet in *Thrixgyne* agrees in every particular with that of *Duthiea nepalensis* and the question now arises, should *Thrixgyne* be maintained as a genus distinct from *Duthiea*? The ovary in *Duthiea* is very remarkable, being hirsute, the very characteristic which gives *Thrixgyne* its name. Actually, except for its strictly 1-flowered spikelets, *Thrixgyne* does not differ from the two several-flowered species of *Duthiea* in any material respect. *Duthiea nepalensis* appears to be 1-flowered but there are the rudiments of another in one spikelet dissected. This suggests that *Thrixgyne* may not be strictly 1-flowered. The resemblance between the two genera is so close that I have no hesitation in reducing *Thrixgyne* to the synonymy of *Duthiea*.

2. *Duthiea bromoides* Hack. in Verh. Zool.-Bot. Ges. Wien 45, 200 (1895).
 Distribution: Kashmir westwards into Afghanistan.



O.T.

Fig. 46. *Duthiea* Hack.
 A, *Duthiea bromoides* Hack. B, *D. nepalensis* Bor. C, *D. oligostachya* (Munro) Stapf. 1, spikelet; 2, lower glume; 3, upper glume; 4, lemma; 5, palea; 6, ovary, style and stigmas; all $\times 2$.

This species grows in the clefts of rocks, often in the most arid places.
 Exsicc.—*J. F. Duthie* 13155, Kashmir (cotype); *R. R. Stewart* 25362, Swat.

3. *Duthiea oligostachya* (Munro) Stapf in Hook., Ic. Pl. (1896) sub tab. 2474.

Avena oligostachya Munro in J. Linn. Soc. (Bot.) 19, 193 (1881), t. 30.

Distribution: Baluchistan, Afghanistan.

This species also grows in the clefts of rocks.

Exsicc.—*Aitchison* 367, Kurram Valley; *Harsukh* 14971, Kurram Valley.

Helictotrichon Bess. ex Roem. et Schult., Syst. Veg. 2, Addit. 526 (1827).

Avenastrum Jess., Deutsch. Graes. 214 (1863) pro parte.

Key to the species of *Helictotrichon*

1. Panicle very contracted, sparingly branched:—
 2. Lemmas 7 mm long or over:—
 3. Panicle 5–10 cm long, 2–2.5 cm broad; lemmas 1–1.5 cm long, hyaline above, brownish and firm below; keels of the palea smooth or minutely scabrid *H. pratense*
 3. Panicle up to 20 cm long, always more than 10 cm long, 1.5 cm broad; lemmas 7–9 mm long, green, produced at the apex into two lobes or awns; palea long-ciliate on the keels *H. schmidii*
 2. Lemmas not more than 6.5 mm long:—
 4. Lower glume 3-nerved; awns twisted at the base; lemma 5 mm long *H. parviflorum*
 4. Lower glume 1-nerved; awns not or hardly twisted *H. burmanicum*
1. Panicle nodding, not contracted, often widely spreading:—
 5. Spikelets green or yellowish; lemmas 6–7 mm long:—
 6. Lemmas smooth, shining, green *H. virescens*
 6. Lemmas more or less scabrid, dull *H. asperum*
 5. Spikelets reddish-brown; lemmas 13 mm long *H. polyneurum*

1. *Helictotrichon asperum* (Munro) Bor in Indian For. Rec. n.s. 1, Bot. 68 (1938).

Avena aspera Munro ex Thwaites, Enum. Pl. Zeyl. 372 (1864).

Avenastrum asperum (Munro) Vierh. in Verh. Ges. Deutsch. Naturf., Leipzig (1913) 85, 2, Heft 1, 672 (1914) in obs.

Distribution: Eastern India through Madras to Ceylon.

This species can always be recognized on account of its extremely scabrid lemmas and nodding panicle.

Exsicc.—*C. B. Clarke* 18659, Khasia; *N. L. Bor* 5338, Naga Hills; *Dr. Bor's collector* 582, Sikkim; *Bourne* 1966, Pulneys.



Fig. 47. *Helictotrichon pratense* (Linn.) Pilger
 1, base of plant $\times 1$; 2, inflorescence $\times 1$; 3, spikelet; 4, lowest lemma with the
 glumes removed and portion of the rhachilla; 5, lower glume; 6, upper glume;
 7, lemma; 8, palea; 9, stamen; 10, ovary and lodicules; all $\times 3$.

Distribution: Central and western Himalaya, 1800–3600 m.

This species is considered in the *Flora of British India* to be a variety of *Avena aspera*, but it seems to be quite distinct. The lemmas of the smaller spikelets are a shining green and the geographical distribution is separate and distinct.

Exsicc.—R. R. Stewart 24577, Swat; J. F. Duthie 13315, Kashmir; J. F. Duthie 25030, Kumaon.

Hierochloe R.Br., Prod. Fl. Nov. Holl. 208 (1810)

nomen genericum conservandum.

Savastana Schrank, Baier. Fl. 1, 100, 337 (1789).

Torresia Ruiz et Pav., Fl. Per. Chil. Prodr. 125 (1794).

Disarrenum Labill., Nov. Holl. Pl. Spec. 2, 82 (1806), t. 232.

Key to the species of *Hierochloe*

1. Spikelets 5–6 mm long, dark brown; panicle loose or dense:—
 2. Leaves ensiform, 8–10 mm broad; lower glume 1-nerved; lower pair of lemmas truncate, very shortly awned *H. laxa*
 2. Leaves linear, not over 6 mm wide; lower glume 3-nerved:—
 3. Panicles very loose; awn exserted, nearly as long as the spikelet; lower lemmas very hairy; plants up to 60 cm tall *H. flexuosa*
 3. Panicles dense; awn very shortly exserted; lower lemmas glabrous or sparsely hairy; plants not more than 20 cm tall *H. tibetica*
1. Spikelets 3–3.5 mm long, pale; panicle rather dense *H. khasiana*

1. ***Hierochloe flexuosa*** Hook. f., Fl. Brit. Ind. 7, 222 (1896).

Distribution: Sikkim-Himalaya at altitudes over 3500 m.

Exsicc.—W. W. Smith 3923, Tosa, Sikkim; Ribu et Rohmoo, Thanka La, Sikkim.

2. ***Hierochloe khasiana*** C. B. Clarke ex Hook. f., Fl. Brit. Ind. 7, 223 (1896).

Distribution: Khasi Hills.

This species is found in swamps and marshes.

Exsicc.—N. L. Bor 18152, Khasia.

3. ***Hierochloe laxa*** R.Br. ex Hook. f., Fl. Brit. Ind. 7, 222 (1896).

Distribution: Western Himalaya, 3000–5000 m.

A handsome grass common in alpine meadows. It is often found on rock ledges.

Exsicc.—J. F. Duthie 3496, Kumaon; R. R. Stewart 9889, Kashmir; N. L. Bor 14022, Lahul.

4. ***Hierochloe tibetica*** Bor in Kew Bull. 1953, 271 (1953).

Distribution: South Tibet.

This species may be found in Sikkim.

Exsicc.—Ludlow, Sherriff & Taylor 5188 (type in B.M.), Kongbo Province, Tibet.

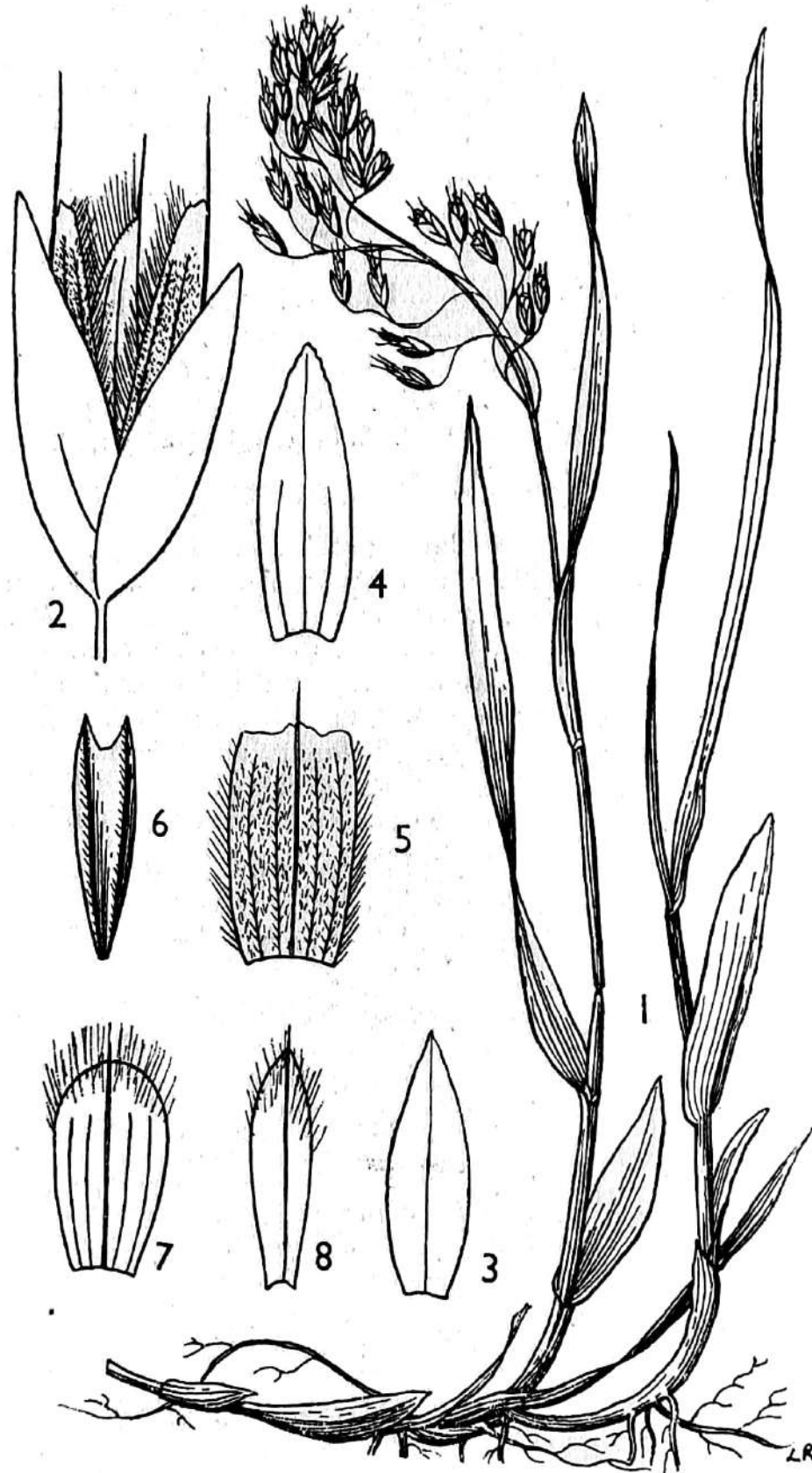


Fig. 48. *Hierochloa laxa* R.Br.
 1, plant $\times 1$; 2, spikelet $\times 10$; 3, lower glume; 4, upper glume; 5, lowest lemma;
 6, its palea; 7, fertile lemma; 8, its palea; all $\times 5$.

Holcus Linn., Gen. Pl. ed. 5, 469 (1754) et in Sp. Pl. ed. 1, 1047 (1753).

Key to the species of *Holcus*

1. Plants tufted, without rhizomes, softly hairy all over with short hairs at the nodes; awn of upper lemma included in the glumes, hook-like

H. lanatus

1. Plants spreading, with creeping rhizomes, densely bearded with spreading or reflexed hairs at the nodes; awn of the upper lemma exerted from the glumes

H. mollis

1. **Holcus lanatus** Linn., Sp. Pl. ed. 1, 1048 (1753).

Aira holcus-lanatus (Linn.) Vill., Hist. Pl. Dauph. 2, 87 (1787).

Avena pallida Salisb., Prodr. Stirp. 24 (1796) non Thunb. (1794).

A. lanata (Linn.) Koel., Descr. Gram. 303 (1802).

Ginannia pubescens Bubani, Fl. Pyr. 4, 321 (1901).

Notholcus lanatus (Linn.) Nash ex Hitchc. in Jepson, Fl. Calif. 1, 126 (1912).

Ginannia lanata (Linn.) F. T. Hubb. in Rhodora 18, 234 (1916).

Distribution: Widely distributed in the northern Temperate Zone of the Old World. It has been introduced into many parts of the world, including India, where it has run wild. It is said to have some value as a fodder when young, but it can become a useless weed in sandy fields. $2n = 14$. Exsicc.—C. B. Clarke 26755, Darjeeling; T. Anderson 1362, Sinchal.

2. **Holcus mollis** Linn., Syst. Nat. ed. 10, 1305 (1759).

Aira mollis (Linn.) Schreb., Spic. Fl. Lips. 51 (1771).

Avena sylvatica Salisb., Prodr. Stirp. 24 (1796).

A. mollis (Linn.) Koel., Descr. Gram. 300 (1802).

Ginannia mollis Bubani, Fl. Pyr. 4, 322 (1901).

Notholcus mollis (Linn.) Hitchc. in Amer. J. Bot. 2, 304 (1915).

Distribution: Widely distributed in Europe and the temperate parts of Asia. Introduced into India in grass seed mixtures as well as into other temperate countries.

This species is sometimes cultivated for ornament in gardens in hill stations in the variety, *variegatus*, which has leaves striped green and white. The rhizomes creep widely in all directions and the grass can be of value as a soil-binder and also a nuisance as a weed. $2n = 28, 35, 42$.

Koeleria Pers., Syn. Pl. 1, 97 (1805).

Key to the species and varieties of *Koeleria*

1. Lemmas definitely awned on the dorsal surface; lower sheaths more or less scarious, shining, silvery

K. argentea

2. Glumes subequal; spikelets 5 mm long; awns 1-2 mm long
var. *argentea*
2. Glumes unequal; spikelets 6 mm long; awns less than 1 mm long
var. *nepalensis*
K. cristata
1. Lemmas not awned; lower sheaths not scarious

1. **Koeleria argentea** Griseb. in Goett. Nachr. 77 (1868).

Distribution: Alpine regions of Tibet and the Himalaya.

var. *argentea*.

Exsicc.—Hook. f. et T. Thoms. s.n., north-west India; *Schlagintweit*, Leh, Ladak.

var. *nepalensis* Domin in Biblioth. Bot. 14, Heft 65, 115 (1907).

K. nepalensis Griseb. in Herb. Schlag., nomen.

Distribution: North-western India.

Exsicc.—*Schlagintweit*, Lahul.

2. **Koeleria cristata** (Linn.) Pers., Syn. Pl. 1, 97 (1805).

Aira cristata Linn., Sp. Pl. ed. 1, 63 (1753) pro parte.

Koeleria gracilis Pers., Syn. Pl. 1, 97 (1805).

Aira gracilis (Pers.) Trin., Fund. Agrost. 144 (1820).

Airochloa cristata (Linn.) Link, Hort. Berol. 1, 127 (1827).

A. gracilis Link, Hort. Berol. 2, 276 (1833).

Dactylis cristata (Linn.) M.B., Fl. Taur. Cauc. 1, 67 (1808).

Festuca cristata (Linn.) Vill., Pl. Dauph. 2, 93 (1787).

Poa nitida Lamk., Tab. Encycl. Meth. Bot. 1, 182 (1791).

Distribution: Widely distributed in the temperate parts of the Northern Hemisphere, including the north-west Himalaya.

It is a particularly common plant on the southern dry slopes of the north-west Himalaya, and provides a certain amount of fodder in these inhospitable areas. Domin has created a number of varieties and sub-varieties, which in view of the variability of this plant do not seem to be worth while keeping up. $2n = 28$.

Exsicc.—N. L. Bor 10261, Lahul; E. M. Saunders s.n., Murree; J. F. Duthie 19832, west Himalaya.

Lophochloa Reichb., Flor. Germ. Excurs. 42 (1830).

Key to the species of *Lophochloa*

1. Tip of the lemma not produced into 2 awns:—
 2. Glumes unequal, thinly hairy or not; rhachilla glabrous or subglabrous:—
 3. Lemma with a curious papillose or tessellate appearance; glumes sparsely hairy or not; spikelets 3-7-flowered; awn shorter than the lemma
L. phleoides

3. Lemma without this curious tessellation but sparsely hairy; spikelets always only 1-flowered; awn as long as the lemma

L. clarkeana

2. Glumes subequal, densely and shortly hairy; rhachilla always produced, clothed with long hairs

L. pumila

1. Tip of the lemma with 2 awns

L. cavanillesii

1. ***Lophochloa cavanillesii*** (Trin.) Bor, comb. nov.

Trisetum cavanillesii Trin. in Acta Hort. Petrop. 1, 63 (1830).

T. gaudinianum Boiss., Voy. Bot. Esp. 2, 653 (1841).

Avena cavanillesii (Trin.) Koch, Syn. ed. 1, 797 (1837).

A. valesiaca Nyman, Syll. Fl. Eur. 414 (1855).

A. loeflingiana Cavanilles, Icon. 1, 34 (1791) non Linn. f. (1781).

Distribution: Arabia, Iran, Iraq, Baluchistan.

Exsicc.—J. F. Duthie 8742, Baluchistan; Griffith 163, Afghanistan; Wingate s.n., north-west India.

2. ***Lophochloa clarkeana*** (Domin) Bor, comb. nov.

Koeleria clarkeana Domin in Biblioth. Bot. 14, Heft 65, 272 (1907).

Distribution: Kashmir.

Domin based his species on the sole collection of C. B. Clarke. It is a rare plant but, I think, distinct from *L. phleoides*.

Exsicc.—Type at Kew (C. B. Clarke 28155, Kashmir).

3. ***Lophochloa phleoides*** (Vill.) Reichb., Fl. Ger. Excurs. 42 (1830).

Festuca phleoides Vill., Fl. Delph. 7 (1785).

Koeleria phleoides (Vill.) Pers., Syn. Pl. 1, 97 (1805).

Brachypodium phleoides (Vill.) P. Beauv., Ess. Agrost. 155 (1812).

Rostraria pubescens Trin., Fund. Agrost. 150 (1820).

Trisetum phleoides (Vill.) Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 1, 65 (1830).

Distribution: From Europe and the Mediterranean Region to the Punjab.

Exsicc.—J. F. Duthie 10847, Kashmir; Inayat 20332, Hazara; T. Thoms. s.n., Lahore.

4. ***Lophochloa pumila*** (Desf.) Bor, comb. nov.

Avena pumila Desf., Fl. Atlant. 1, 103 (1798).

Trisetum pumilum (Desf.) Kunth, Enum. Pl. 1, 297 (1833).

Koeleria sinaica Boiss., Fl. Orient. 5, 573 (1884).

K. pumila (Desf.) Domin in Fedde, Rep. Sp. Nov. 2, 31 (1906).

Distribution: North-west India to Mediterranean Region.

Exsicc.—R. R. Stewart 23443, Rawalpindi.

Pseudodanthonia Bor et Hubbard in Kew Bull.

1957, 425 (1958).

1. ***Pseudodanthonia himalaica*** (Hook. f.) Bor et Hubbard in Kew Bull. 1957, 427 (1958).

Danthonia himalaica Hook. f., Fl. Brit. Ind. 7, 281 (1896).

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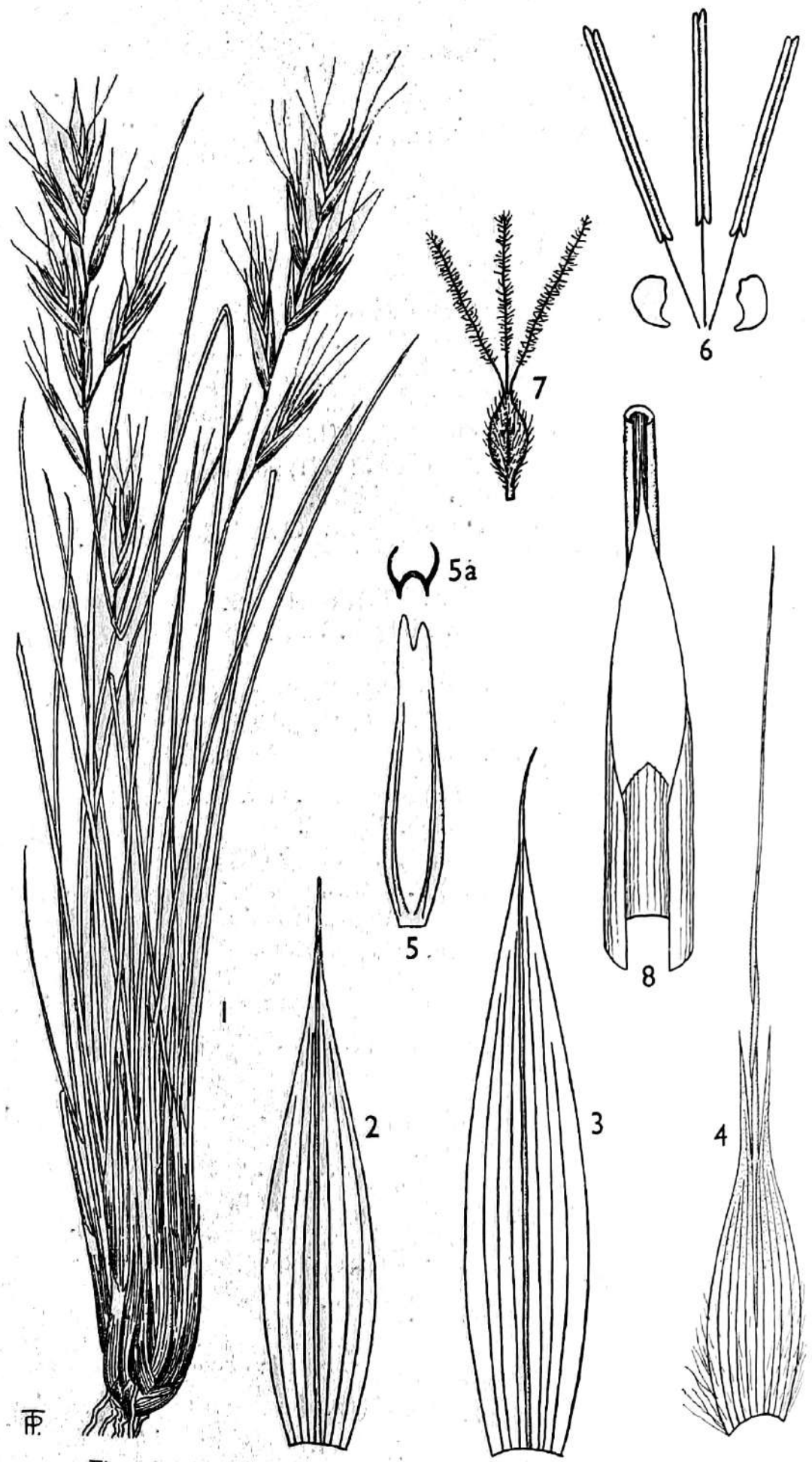


Fig. 49. *Pseudodanthonia himalaica* (Hook. f.) Bor et Hubbard
 1, plant $\times \frac{2}{3}$; 2, lower glume $\times 4$; 3, upper glume $\times 4$; 4, lemma $\times 4$; 5, palea
 $\times 4$; 5a, transverse section of palea; 6, lodicules and stamens, $\times 6$; 7, pistil $\times 6$;
 8, ligule $\times 6$.

Distribution: Northwest Himalaya, 2000–2300 m. Not of any account as a fodder and in fact appears to be rather rare.
 Exsicc.—J. F. Duthie 14467, Tehri; J. S. Gamble 24856, Jaunsar.

Trisetum Pers., Syn. Pl. 1, 97 (1805).

Key to the species of *Trisetum*

1. Stem below the panicle hairy; axis also hairy:—
 2. Lower glume lanceolate- or oblong-acuminate, 4–5.5 mm long or if shorter, leaves glabrous; spikelets silvery; panicle very dense; leaves glabrous and rigid; tip of lemma shortly aristate *T. micans*
 2. Lower glume lanceolate- or oblong- or elliptic-acute, 3–4.5 mm long; spikelets yellowish, green, brownish or purplish, not silvery; leaves more or less hairy:—
 3. Panicle spiciform or ovoid, strict, erect, densely spiculate; spikelets shortly pedicelled *T. spicatum*
 3. Panicle rather loose, if more or less dense then long and narrow; spikelets often brownish; sheaths hairy *T. clarkei*
1. Stem below the panicle glabrous; axis also glabrous:—
 4. Panicle very effuse; lower glume very narrow, acuminate; branches naked at the base:—
 5. Lower glume 3–4 mm long; upper glume oblong-obovate-acute, 4.5–5 mm long; lemmas 5.5 mm long coriaceous, granular, dull; spikelets yellowish or greenish *T. flavescens*
 5. Lower glume 4.5–6 mm long, acuminate; upper glume 6.5–8 mm long; lemma 6.5–8 mm long, shining, not dull; spikelets usually brownish or bronze *T. scitulum*
 4. Panicle more or less dense; lower glume narrow, acuminate; branches spiculate to the base; spikelets dark golden-brown; lower glume 3–4.5 mm long; upper glume 4–5.5 mm long; lemma 5.5–6.5 mm long, 2 mm wide *T. aeneum*

1. **Trisetum aeneum** (Hook. f.) R. R. Stewart in Brittonia 5, 4, 431 (1945).

Trisetum aureum Nees ex Steud., Syn. Pl. Glum. 1, 225 (1854) non Tenore, (1820).

Avena aenea Hook. f., Fl. Brit. Ind. 7, 279 (1896).

Distribution: Western Himalaya from Kashmir to Kumaon.

Exsicc.—J. F. Duthie 12548, Kashmir; N. L. Bor 15560, Manali.

2. **Trisetum clarkei** (Hook. f.) R. R. Stewart in Brittonia 5, 4, 431 (1945).

Avena clarkei Hook. f., Fl. Brit. Ind. 7, 278 (1896).

Distribution: North-west Himalaya from Kumaon to Kashmir and Hazara.

Exsicc.—R. R. Stewart 21717, Kashmir; C. B. Clarke 22985, Dalhousie; Inayat s.n., Nila, Kagan, Hazara.

GG

POOIDEAE—BRACHYPODIEAE

BRACHYPODIEAE *Harz* in *Linnaea* 43, 15 (1880)

Spikelets all alike, very shortly pedicelled, several- to many-flowered, terete; upper florets often imperfect; rachilla disarticulating above the glumes and between the florets. Glumes unequal, persistent, the lower 1-5-nerved, the upper 3-7-nerved; lemmas 7-9-nerved, lanceolate, acuminate, awned from the tip, rounded on the back, scarious on the margins; palea as long as the lemmas, hyaline, 2-nerved and 2-keeled, pectinately ciliate on the keels; awn terminal, straight, scabrid. Ovary elongate, with a terminal villous or hairy appendage; styles 2, borne laterally below the appendage; stigmas plumose. Lodicles 2, ciliate. Stamens 3. Grains hairy at the top, tightly enclosed by the lemma and palea; hilum elongate, linear; embryo small; starch-grains simple.

Slender annual or perennial herbs. Leaf-blades narrow, acuminate, with festucoid anatomy; silica-cells variable; hairs 1-celled. Inflorescence terminal, spike-like, with the spikelets seated on very short pedicels on the opposite sides of and with the sides of the lemmas touching the tough axis.

Chromosomes small; basic numbers 5, 7, 9.

Genus: Brachypodium

Brachypodium *P. Beauv.*, *Ess. Agrost.* 100 (1812).

Hemibromus *Steud.*, *Syn. Pl. Glum.* 1, 317 (1854).

Trachynia *Link.*, *Hort. Berol.* 1, 42 (1827).

Key to the species of *Brachypodium*

1. An annual grass; inflorescence of few (1-3) spikelets crowded at the tip of the peduncle; lemma 7-8 mm long; awn 3-4 mm long; spikelets compressed, often glaucous *B. distachyon*
1. Perennial grasses; spikelets terete; spikes long:—
 2. Awns of the lemma shorter than the lemma; leaf-sheaths and culms glabrous; rhizomes present *B. pinnatum*
 2. Awns of the lemma as long as or longer than the lemma; leaf-sheaths hairy; culms hairy at the nodes; rhizomes absent *B. sylvaticum*

1. **Brachypodium distachyon** (*Linn.*) *P. Beauv.*, *Ess. Agrost.* 101, 155 (1812).

Bromus distachyos *Linn.*, *Cent. Pl.* 2, 8 (1756).

Festuca distachyos (*Linn.*) *Roth, Cat. Bot. Fasc.* 1, 11 (1797).

Trachynia distachya (*Linn.*) *Link, Hort. Berol.* 1, 43 (1827).

Zerna distachyos *Panz. ex Jacks.*, *Ind. Kew.* 2, 1249 (1895).

Distribution: Northern Hemisphere, mountains and temperate parts of Asia.

Exsicc.—*R. R. Stewart* 23306, Punjab; *Wingate* s.n., Chitral.

POOIDEAE—BROMEAE

BROMEAE Dumort., Obs. Gram. Belg. 82, 115 (1823) as *Bromaceae*

Spikelets all alike, several- to many-flowered, terete or laterally compressed, hermaphrodite; upper florets often imperfect; rhachilla disarticulating above the glumes and between the florets. Glumes unequal, persistent, the lower 1-3-nerved, the upper usually 3-5(7)-nerved, glabrous or hairy, often scarious or shining on the margins; lemmas rounded or keeled on the dorsal surface, 5-9-nerved, 2-cleft or lobed, awned from between the teeth or lobes, awn straight or recurved, scabrid, sometimes twisted at the base; lobes rarely aristate; paleas usually shorter than the lemmas, 2-nerved, 2-keeled; keels ciliate or scabrid. Ovary oblong, with a terminal appendage which is hairy or villous; styles 2, inserted laterally below the appendage, short; stigmas plumose. Lodicules 2, oblong, obcuneate or lanceolate. Stamens 3 or 2. Grain linear-oblong, usually concave-convex in section, adherent to the palea; hilum linear, filiform, the length of the grain; embryo small, basal; starch-grains simple.

Annual or perennial grasses. Leaf-blades usually narrow, glabrous or hairy, with festucoid anatomy; leaf-sheaths tubular; hairs 1-celled; silica-cells oblong; ligules membranous. Spikelets pedicelled, arranged in dense or loose panicles.

Chromosomes large; basic number 7.

Genera: Boissiera

Bromus

Key to the genera of **Bromeae**

1. Lemmas rounded on the back with 9 prominently ridged nerves which pass out into recurved awns **Boissiera**
1. Lemmas rounded or keeled, without ribbed nerves; awns at the most three **Bromus**

Boissiera Hochst. ex Steud., Syn. Pl. Glum. 1, 200 (1854).

1. **Boissiera squarrosa** (Soland.) Nevski in Act. Univ. As. Med. ser. 8b, Bot. fasc. 17, 30 (1934).

Pappophorum squarrosum Soland. in Russell, Nat. Hist. Alepp. 2, 244 (1794).

Boissiera bromoides Hochst. ex Steud., Syn. Pl. Glum. 1, 200 (1854).

Pappophorum pumilio Trin. in Mém. Acad. Sci. Pétersb., sér. 6, 1, 92 (1830).

P. sinaicum Trin. in loc. cit. 4, 54 (1838).

Boissiera pumilio (Trin.) Hack. in Denkschr. Acad. Wien 50, 9 (1885).

Distribution: Baluchistan, Afghanistan, Iraq, Iran, Central Asia, Egypt.
 Grows in very inhospitable places and is a welcome fodder for sheep, goats, mules and camels.
 Exsicc.—*Ashgar Ali* 33, Baluchistan; *A. V. Monro* s.n., Quetta.

Bromus Linn., Gen. Pl. ed. 5, 33 (1754) et in
 Sp. Pl. 76 (1753).

Key to the species and varieties of *Bromus*

1. Lemmas rounded on the back:—
 2. Perennials; lower glume 1-nerved; upper 5-nerved; lemmas 5-7-nerved:—
 3. Awns less than half the length of the lemma or absent; lower glume 6-8 mm, upper 8-10 mm long; lemma 8-12 mm long, glabrous or pubescent *B. inermis*
 4. Spikelets awnless, glabrous var. *inermis*
 4. Spikelets awned or awnless, more or less pubescent:—
 5. Inflorescence a panicle; spikelets pubescent to villous var. *villosus*
 5. Inflorescence reduced to a raceme; spikelets villous, awned var. *confinis*
 3. Awn half the length of the lemma or more:—
 6. Awn half the length of the lemma or as long, straight; inflorescence a panicle; lower glume 6-8 mm, upper 6-12 mm long; lemma 8-12 mm long *B. ramosus*
 6. Awn as long as the lemma or longer, recurved; lower glume 5-7.5 mm, upper 7.5-8 mm long; lemma 8-10 mm long *B. himalaicus*
 7. Panicle-branches branched var. *himalaicus*
 7. Panicle-branches simple ending in solitary spikelet var. *grandis*
2. Annuals:—
 8. Spikelets cuneiform:—
 9. Lower glume 4-6 mm, upper 8-10 mm long; lemma 10-12 (16) mm long; awns 8-18 mm long; leaves hairy; spikelets often erect; anthers 1 mm long *B. tectorum*
 9. Lower glume 17 mm long; upper 28 mm long; lemma 25-30 mm long; awns 35-50 mm long; anthers 1.3 mm long *B. diandrus*
 8. Spikelets elliptic-oblong or tapering towards the tip:—
 10. Lower glume 1-nerved, upper 3-nerved:—
 11. Awn 4-5 times as long as the lemma; lemma 4 mm long *B. gracillimus*
 11. Awn 1-2 times as long as lemma; lemma 7-9 mm long *B. japonicus* var. *falconeri*
 10. Lower glume 3-5-nerved; upper 5-7-nerved; awn about as long as the lemma to twice as long:—

12. Panicle more or less spreading with drooping branches which are generally much longer than the spikelets:—
 13. Palea 1.5–2 mm shorter than the lemma; anthers about 1 mm long; awn flexuous *B. japonicus* var. *japonicus*
 13. Palea equal to the lemma in length or only slightly shorter; anthers 4 mm long; awn straight *B. arvensis*
12. Panicle compact to very dense, crowded with short straight branches which are generally shorter than the spikelets:—
 14. Awns more or less straight in the fruiting spikelet, not conspicuously recurved:—
 15. Spikelets glabrous:—
 16. Lower glume 3-nerved, 5 mm long; upper glume 5-nerved, 7 mm long; lemma 7-nerved, 8–8.5 mm long; anthers 1.4 mm long *B. gedrosianus*
 16. Lower glume 1–3-nerved, 9–10 mm long; upper glume 5-nerved, 11–12 mm long; lemma 7–9-nerved, 14–17 mm long; anthers 1–1.3 mm long *B. oxyodon*
 15. Spikelets appressedly hairy to almost glabrous; lower glume 3–5-nerved, 6–7 mm long; upper 7–9-nerved, 8 mm long; lemma 8–11 mm long, appressedly pubescent, papery, scarious, obovate, with elevated nerves, 7-nerved; anthers 1–2 mm long *B. mollis*
 14. Awns recurved in the fruiting spikelet, almost at right-angles to the lemma:—
 17. Spikelets 1.5 to nearly 2 cm long; lemma 7–9 mm long, narrow, glabrous or hairy; panicle densely crowded with spikelets *B. scoparius*
 17. Spikelets 2–4 cm long; lemmas 11–15 mm long:—
 18. All lemmas except perhaps the uppermost (without anthers?) with one awn, the uppermost with lateral weak, straight points; spikelets roundish in section, lanceolate *B. macrostachys*
 18. All lemmas, except perhaps the lowest with three, coloured, recurved awns; spikelets flat, oblong-lanceolate *B. danthoniae*
1. Lemmas keeled on the back *B. unioloides*

1. ***Bromus arvensis*** Linn., Sp. Pl. ed. 1, 77 (1753).
B. erectus var. *arvensis* (Linn.) Huds., Fl. Angl. ed. 2, 50 (1778).
Serrafalcus arvensis (Linn.) Godr., Fl. Lorr. 3, 185 (1844).

Distribution: Temperate Europe and Asia.

According to Hubbard the species is cultivated for hay in Europe on poor light soils. $2n = 14$.

2. ***Bromus danthoniae*** (Desf.) Trin. in C. A. Mey., Verz. Pl. Cauc. 24 (1831).

97
see addenda
925

POOIDEAE—CENTOTHECEAE**CENTOTHECEAE** Ridley, Mat. Fl. Malay. Pen. 3, 122 (1907)

Spikelets 1- to several-flowered, in the former the fertile floret succeeded by several empty lemmas, in the latter the florets all hermaphrodite or the uppermost reduced; rhachilla slowly disarticulating above or below the glumes, produced and bearing a rudimentary lemma. Glumes somewhat unequal or subequal, shorter than the lemmas, 3-7-nerved; lemmas of the same texture as the glumes, 3-9-nerved, glabrous, or bearing tubercle-based bristles on the margins, awnless or awned with a retrorsely scabrid awn from the tip; sterile lemmas, if present, smaller and narrower than the fertile, empty, awned or unawned; palea 2-keeled, hyaline, as long as the lemmas. Lodicules 2, cuneate. Stamens 2 or 3. Ovary surmounted by two short styles which are free or shortly connate at the base. Grain loosely held between the lemma and palea; hilum basal; embryo one-third the length of the caryopsis; starch-grains mainly simple.

Perennial or annual grasses. Leaf-blades broad, flat, with tessellate nervation and panicoid anatomy; silica-cells cross-shaped to dumb-bell-shaped; two-celled micro-hairs present, elongate. Spikelets pedicelled on the branches of loose or contracted panicles. Ligules obscure, very narrow, membranous.

Chromosomes small; basic number 12.

Genera: *Centotheca*

Lophatherum

Key to the genera of **Centotheceae**

1. Lemmas not awned, at the most mucronate, often furnished with reflexed tubercle-based bristles on the margins **Centotheca**
1. Lemmas awned or shortly mucronate, without tubercle-based bristles; upper lemmas represented by a pencil of retrorsely barbed awns **Lophatherum**

Centotheca Desv. in Nouv. Bull. Soc. Philom. 2, 189 (1810).

Key to the varieties of *Centotheca lappacea*

1. Leaves broadly elliptic-acute var. *lappacea*
1. Leaves narrowly elliptic-acuminate var. *longilamina*

✓ 1. **Centotheca lappacea** (Linn.) Desv. in Nouv. Bull. Soc. Philom. 2, 189 (1810).

Cenchrus lappaceus Linn., Sp. Pl. ed. 2, 1488 (1763).

Centotheca latifolia Trin., Fund. Agrost. 141 (1820) nomen illegitimum.

C. parviflora Anderss. in Peters, Reise Mossam. Bot. 560 (1863).



Fig. 50. *Centotheca lappacea* (Linn.) Desv.
 1, whole plant $\times \frac{1}{2}$; 2, spikelet $\times 6$; 3, lower glume; 4, upper glume; 5, unarmed lemma; 6, palea; 7, flower and palea; 8, pistil; 9, armed lemma; all $\times 8$.

Holcus latifolius Osb., Dagb. Ostind. Res. 247 (1757); Linn., Syst. Nat. ed. 10, 1305 (1759) non *Centotheca latifolia* Trin. (1820).

Melica lappacea (Linn.) Rasp. in Ann. Sci. Nat. sér. 1, 5, 443 (1825).

M. diandra Roxb., Fl. Ind. 1, 329 (1820).

M. refracta Roxb., loc. cit. 329.

Poa latifolia Forst. f., Prod. 8 (1786).

Torresia biflora et *latifolia* Roem. et Schult., Syst. Veg. 2, 515 (1817).

Uniola lappacea (Linn.) Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 1, 358 (1830).

Festuca latifolia Roth, Nov. Pl. Sp. 75 (1821).

F. blepharophora Roem. et Schult., Syst. Veg. 2, 728 (1817).

F. ciliaris Heyne ex Roem. et Schult. loc. cit. 728.

Panicum festuciforme Hochst. ex Hook. f., Fl. Brit. Ind. 7, 332 (1896).

Distribution: Widely distributed in South-east Asia, China, Polynesia and Tropical Africa.

A forest grass, often found in glades, along forest roadsides and at the forest margins, and an excellent fodder. The grains are distributed by the reflexed tubercle-based spines on the lemma becoming attached to the hairs or fur of passing animals. $2n = 24$. *Cenchrus lappaceus* Linn. (1763) and *Holcus latifolius* Osb. (1757) are two names which have been applied to the same species, though the types are different. The combination *Centotheca lappacea* was made by Desvaux in 1810 and was based upon *Cenchrus lappaceus* Linn. In 1820 Trinius published the name *Centotheca latifolia* but he based the name not on *Holcus latifolius* but on *Cenchrus lappaceus* (Fund. Agrost. 141). The epithet *latifolia* therefore became illegitimate in *Centotheca*, and the species must be known by Desvaux's combination.

var. ***lappacea***.

Exsicc.—F. Ballard 1001, Ceylon; W. A. Talbot 2192, North Kanara; N. L. Bor 6636, Naga Hills; U Thein Lwin 641, Burma. $2n = 24$.

var. ***longilamina*** (Ohwi) Bor comb. nov.

Centotheca longilamina Ohwi in Bull. Tokyo Sci. Mus. no. 18, 10 (1947).

Ohwi maintained that his species was different from *C. lappacea* on account of the long narrow leaves, ciliate at the base, and the emucronate lemmas. The mucro of the lemma is not always evident in typical *C. lappacea*, the margins of the leaf bases are ciliate or not in the series at Kew. At the most, I think this can only be called a variety of *C. lappacea*.

Exsicc.—F. Ballard 1400, Hedigala, Ceylon; Po Khant 1817, Burma; Wallich 8008, Tavoy.

Lophatherum Brongn. in Duperr., Voy. Coq.

Bot. 49 (1831), t. 8.

Acroelytrum Steud. in Flora 29, 20 (1846).

Allelothea Steud., Syn. Pl. Glum. 1, 117 (1854).

Key to the varieties of *Lophatherum gracile*

1. Lower glume of the spikelet glabrous

1. Lower glume bearded at the base

1. **Lophatherum gracile** Brongn. in Duperr., Voy. Coq. Bot. 50 (1831),
t. 8. var. *gracile*
var. *zeylanicum*

L. humile Miq., Prol. Fl. Jap. 170 (1867).

L. elatum Moritzi, Syst. Verz. Zoll. 102 (1845-46) nomen.

Acroelytrum japonicum Steud. in Flora 29, 21 (1846).

Lophatherum multiflorum Steud., Syn. Pl. Glum. 1, 300 (1854).

L. dubium Steud., loc. cit. 300.

L. lehmannii Nees ex Steud., loc. cit. 300.

Allelothea urvillei Steud., loc. cit. 117.

Lophatherum pilosulum Steud., loc. cit. 428 (1855).

L. annulatum Franch. et Sav., Enum. Pl. Japon. 2, 605 (1876).

L. geminatum Baker in J. Linn. Soc. (Bot.) 20, 300 (1883).

var. **gracile**.

Distribution: North-east Himalaya, Khasi and Naga Hills, Burma, Malaya, Ceylon, China, Japan, Australia.

This is a most variable species. Extreme states have given rise to the numerous names here brought together under one head, but these states are joined by intermediates.

The awns of the lemmas are retrorsely scabrid and by this means the ripe fruits become attached to the fur or hair of passing animals.

This species is essentially a forest grass—and although it may be found in shady places outside the forest, it is at its best in moist forest shade.

Hooker [*Fl. Brit. Ind.* 7, 331 (1896)] expressed surprise that this plant had not been up till then reported from the Deccan Peninsula. In the interval it has been collected in South India, but only once, in Travancore. Exsicc.—*Meebold* 5796, Manipur; *C. B. Clarke* 36999, Sikkim Terai; *C. B. Clarke* 5314, Khasia; *Venkoba Rao* 4103, Travancore; *F. Ballard* 1386, Ceylon.

var. **zeylanicum** (Hook. f.) Bor comb. nov.

Lophatherum zeylanicum Hook. f., in Trimen, Fl. Ceyl. 5, 303 (1900).

Distribution: Ceylon, endemic.

Exsicc.—*Thwaites* C.P. 920, Ceylon; *Walker*, Ceylon.

POOIDEAE—CHLORIDEAE**CHLORIDEAE** *Agardh*, Aphor. Bot. 150 (1823)[*Cynodoneae* Dumort., Obs. Gram. Belg. 83, 140 (1823)]

Spikelets 1- to several-flowered, slightly compressed laterally, with one floret hermaphrodite and with or without imperfect florets above or below it; rhachilla disarticulating above the persistent glumes; glumes herbaceous, pale, translucent, 1-3-nerved; lemmas membranous to chartaceous, entire, emarginate or 2-lobed, awned or awnless, 1-3-nerved with the lateral nerves near the margins and often ciliate; palea often obovate, 2-keeled, narrowly winged on the keels. Lodicules 2, rarely absent. Stamens 3. Ovary glabrous. Styles 2; stigmas plumose. Grain enclosed between the scarcely changed lemma and palea; hilum in a small depression at the base of the grain; embryo about half the length of the grain; starch-grains compound.

Annual or perennial herbs; leaf-blades narrow, with panicoid anatomy; silica-cells saddle-shaped or transversely dumb-bell-shaped; micro-hairs two-celled, swollen or round; ligule a ciliate rim or membranous. Spikelets sessile or subsessile, secund in one or two rows on the continuous rhachis of solitary, digitate or scattered spikes or spike-like racemes. First foliage leaf of the seedling broad, flat, horizontal.

Chromosomes small; basic number 9, 10 rarely 7.

<i>Genera:</i>	<i>Bouteloua</i>	<i>Melanocenchris</i>
	<i>Chloris</i>	<i>Microchloa</i>
	<i>Cynodon</i>	<i>Oropetium</i>
	<i>Dichaetaria</i>	<i>Schoenefeldia</i>
	<i>Enteropogon</i>	<i>Tetrapogon</i>
	<i>Gymnopogon</i>	<i>Trichloris</i>

Key to the genera of **Chlorideae**

1. Fertile lemma 1-awned or awnless:—
 2. Inflorescence terminal, spicate, not of digitate or racemose spikes; lemmas not obovate:—
 3. Inflorescence of spaced clusters of awned spikelets on a simple rhachis **Melanocenchris** //
 3. Inflorescence a simple spike or spikes of awned or awnless spikelets:—
 4. Spikelets more or less sunk in the thick tough rhachis **Oropetium** //
 4. Spikelets not sunk in a thick rhachis:—
 5. Awns of the spikelets, if present, not more than 8 mm long:—
 6. Inflorescence a long curved secund spike of 1-flowered

- awnless spikelets
6. Inflorescence a second spike (or rarely spikes) of awned spikelets **Microchloa**
5. Awns of the spikelets 12–15 mm long **Enteropogon**
2. Inflorescence of digitate spikes or spikes racemose, very rarely solitary, but if so the lemmas obovate:— **Schoenefeldia**
7. Spikes racemose, distant, falling entire **Bouteloua** (*curtipendula*)
7. Spikes not falling entire:—
8. Spikelets with one or more fertile florets and one or more imperfect florets above them; lemmas usually widened upwards:—
9. Imperfect florets reduced to awns **Gymnopogon**
9. Imperfect florets or reduced lemma awned:—
10. Spikes 1–3; fertile florets 2 or more **Tetrapogon** //
10. Spikes 4 or more; fertile florets one only **Chloris** //
8. Spikelets with one fertile floret and no imperfect florets (rhachilla produced in *Gymnopogon* and bearing 2–3 awns):—
11. Spikelets awnless **Cynodon** //
11. Spikelets with awns:—
12. Inflorescence consisting of a number of racemes alternately arranged on a short axis:—
13. Annual; spikelets closely crowded in the raceme, 1-flowered with the rhachilla produced and carrying 2–3 awns; spikelets with awns 10 mm long **Gymnopogon**
13. Perennials; inflorescence racemose or with a few short branches; spikelets distant or closely crowded:—
14. Inflorescence sometimes shortly branched at the base; lowest lemma long-awned; awn up to 4 cm long **Dichaetaria**
14. Inflorescence of solitary or a few racemes; lowest lemma mucronate **Bouteloua** (*gracilis*)
12. Spikes digitate, 1–3; awn long, flexuous **Schoenefeldia**
1. Fertile lemma 3-awned **Trichloris**

Bouteloua Lagasca in Varied. Cienc. 2, 4, 134 (1905).

Actinochloa Willd. ex Roem. et Schult. Syst. Veg. 2, 22, 417 (1817).

Atheropogon Muhl. in Willd., Sp. Pl. 4, 937 (1806).

Chondrosium Desv., J. Bot. 3, 68 (1813).

Dinebra DC., Cat. Hort. Monsp. 104 (1813) pro parte.

Eutriana Trin., Fund. Agrost. 161 (1820).

Triathera Desv. in Nov. Bull. Soc. Philom. 2, 188 (1810).

Key to the species of *Bouteloua*

1. Perennials:—

2. Inflorescence consisting of an erect axis, 15–25 cm long, with distant secund spikes 1–2 cm long, falling entire at maturity

B. curtipendula

2. Inflorescence of 1–3 curved persistent spikes, 1–2 cm long, each with very numerous crowded secund spikelets on the convex side

B. gracilis

B. aristidoides

1. Annual

1. ***Bouteloua aristidoides*** (H.B.K.) Griseb., Fl. Brit. West Indies 537 (1864).

Dinebra aristidoides H.B.K., Nov. Gen. et Sp. 1, 171 (1816).

Atheropogon aristidoides (H.B.K.) Roem. et Schult., Syst. Veg. 2, 415 (1817).

Eutriana aristidoides (H.B.K.) Trin., Gram. Unifl. 242 (1824).

Dinebra hirsuta J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 292 (1830).

Eutriana hirsuta (Presl) Kunth, Enum. Pl. 1, 280 (1833).

Aristida unilateralis Willd. ex Steud., Nom. Bot. ed. 2, 1, 132 (1840).

Bouteloua ciliata Griseb. in Abh. Ges. Wiss. Goett. 24, 302 (1879).

Triathera aristidoides (H.B.K.) Nash in Small, Fl. South-east. U.S. 137 (1903).

Distribution: U.S.A. in deserts and foothills in Texas, Nevada, Southern California, Mexico. Introduced into India.

2. ***Bouteloua curtipendula*** (Michx.) Torr. in Emory, Notes Mil. Recon. 154 (1848).

Chloris curtipendula Michx., Fl. Bor. Amer. 1, 59 (1803).

Bouteloua racemosa Lag., Var. Cienc. 4, 141 (1805).

B. pendula Lag., loc. cit. 141, nomen.

Atheropogon apludoides Muhl. in Willd., Sp. Pl. 4, 937 (1806).

Bouteloua melicaeformis Brouss. ex Hornem., Enum. Pl. Hort. Hafn. 7 (1807) nomen.

B. melicoides P. Beauv., Ess. Agrost. 40, 155 (1812), t. 9, f.6.

Dineba curtipendula P. Beauv., Ess. Agrost. 98, 158, 160 (1812), t. 16, f.1.

D. melicoides P. Beauv., loc. cit. 160, nomen.

Cynosurus secundus Pursh, Fl. Amer. Sept. 2, 728 (1814).

Atheropogon racemosus (Lag.) Roem. et Schult., Syst. Veg. 2, 414 (1817).

Dineba secunda (Pursh) Roem. et Schult., loc. cit. 711.

Aristida secunda Rudge ex Roem. et Schult., loc. cit. 711.

Eutriana curtipendula (Michx.) Trin., Fund. Agrost. 161 (1820).

Melica curtipendula Michx. ex Steud., Nom. Bot. 1, 91, 519 (1821).

Cynodon curtipendula Raspail in Ann. Sci. Nat., Bot. 5, 303 (1825).

C. melicoides (P. Beauv.) Raspail, loc. cit. 303.

Chloris secundus (Pursh) Eaton, Man. ed. 5, 173 (1829).

Andropogon curtipendulus Spreng. ex Steud., Nom. Bot. ed. 2, 1, 90 (1840).

Eutriana affinis Hook. f. in Trans. Linn. Soc. 20, 175 (1847).

HH

Heterostegon curtispindula Schwein. ex Hook. f. in Trans. Linn. Soc. 20, 175 (1847).

Atheropogon curtispindulus Fourn., Mex. Pl. 2, 138 (1886).

A. medius Fourn., loc. cit. 139.

A. affinis (Hook. f.) Fourn., loc. cit. 141.

Distribution: Widely distributed in the prairie and adjoining states of the U.S.A. Introduced into other regions of the world, including Argentina and India.

This grass is reported to be excellent for grazing and also for making into hay.

3. ***Bouteloua gracilis*** (H.B.K.) Lag. ex Steud., Nom. Bot., ed. 2, 1, 219 (1840).

Chondrosium gracile H.B.K., Nov. Gen. et Sp. 1, 176 (1816), t. 58.

Actinochloa gracilis (H.B.K.) Willd. ex Roem. et Schult., Syst. Veg. 2, 418 (1817).

Atheropogon oligostachyus Nutt., Gen. Pl. 1, 78 (1818).

A. gracilis (H.B.K.) Spreng., Syst. Veg. 1, 293 (1825).

Chondrosium oligostachyum (Nutt.) Torr. in Marcy, Expl. Red. Riv. 300 (1853).

Bouteloua oligostachya (Nutt.) Torr. ex A. Gray, Man. ed. 2, 553 (1856).

B. major Vasey in Bull. Torr. Bot. Club 14, 9 (1887) nomen.

B. stricta Vasey in Bull. Torr. Bot. Club 15, 49 (1888).

Distribution: Prairie of the U.S.A., extending to southern California, Texas and Mexico. Introduced into India and reported to be doing well. In the U.S.A. the species is in high regard as a grazing grass.

Chloris Sw., Prod. Veg. Ind. Occ. 25 (1788).

Chloroides Fisch. ex Regel in Ind. Sem. Hort. Petrop. 28 (1863).

Heterolepis Ehrenb. ex Boiss., Fl. Orient. 5, 554 (1884).

Phacellaria Willd. ex Steud., Nom. Bot. ed. 2, 1, 353 (1840).

Schultesia Spreng., Pugill. 2, 17 (1815).

Key to the species of *Chloris*

1. Spikelets 1.5 mm long, close-packed on the rhachis; spikes closely appressed; awns 3, up to 1.5 cm long *C. roxburghiana*
1. Spikelets more than 2.5 mm long:—
 2. Lemma with a row of glands or tubercles on each side of the midrib *C. prieurii*
 2. Lemma without such glands or tubercles:—
 3. Perfect florets one:—
 4. Empty lemmas above the fertile floret solitary, well-developed or rudimentary:—
 5. Spikes usually long (up to 25 cm), widely spreading; upper glume 5–7.5 mm long; empty lemma represented by a fine

awn up to 1.25 cm long; plant erect from the base

C. dolichostachya

5. Spikes not more than 6.5 cm long, closely crowded, not spreading, ascending; upper glume 3–3.5 mm long, aristulate; empty lemma oblanceolate, truncate with an arista 4 mm or more long; stems often prostrate, rooting at the nodes and sending up flowering culms

C. virgata

4. Empty lemmas above the lowest two to four:—

6. Culms glabrous below the inflorescence:—

7. Spikelets 3 mm long or more; awns three, 2–3 mm long; lowest lemma elliptic in shape; upper oblong-obovate; culms stoloniferous

C. gayana

7. Spikelets 2.5 mm long; awns three, four or five, up to 8 mm long or more; plants often with stout prostrate stems sending up flowering culms from the rooted nodes:—

8. A perennial, creeping below and rooting at the nodes; spikelets cuneate, with four or five awns; second lemma very similar to the lowest but smaller

C. montana

8. An annual grass; spikelets plump, with three, rarely four, awns; second lemma of thinner texture than the lowest, much smaller, truncate, obovate, eventually globose

C. barbata

6. Culms puberulous below the inflorescence:—

9. Spikelets with four awns; lowest lemma very long-bearded on the keel, coarsely scabrid dorsally; whole plant hairy; racemes short, not over 2.5 cm long

C. wightiana

9. Spikelets with five awns; lowest lemma not bearded or dorsally scabrid, but with some white hairs on each side of the keel; sheaths, leaves and nodes glabrous; racemes about 4 cm or more long

C. quinquesetica

3. Perfect florets two; spikelets with four awns; culms minutely puberulous below the inflorescence

C. bournei

- ✓ 1. ***Chloris barbata*** Sw., Fl. Ind. Occ. 1, 200 (1797).

Andropogon barbatus Linn., Mant. Pl. Alt. 302 (1771) non Linn. (1759).

Chloris inflata Link, Enum. Pl. Hort. Berol. 1, 105 (1821).

Ch. rufescens Steud., Syn. Pl. Glum. 1, 206 (1854).

Distribution: Tropics of South-east Asia, introduced elsewhere (but considered to be native in Tropical America).

Cattle are said to be partial to this grass when it is young, but to avoid it when the inflorescence matures.

The epithet *barbatus* is illegitimate in the genus *Andropogon* since *Andropogon barbatus* Linn. (1771) is a later homonym of *A. barbatus* Linn. (1759), both names being based on different plants. The epithet *barbata* is, however, not illegitimate in the genus *Chloris* and Swartz was perfectly in order in calling his plant *Chloris barbata*, there being no other epithet

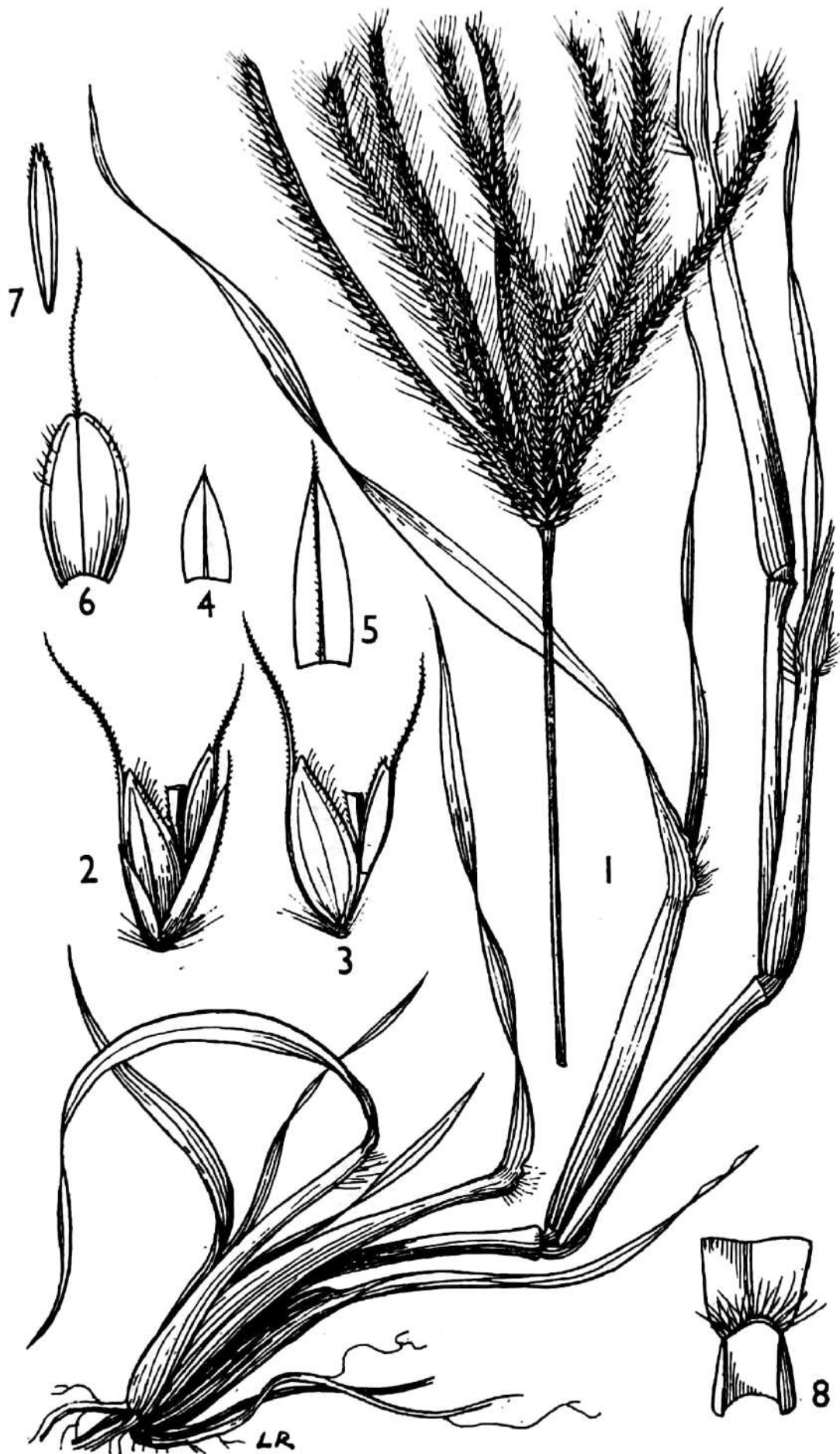


Fig. 51. *Chloris gayana* Kunth
 1, plant and inflorescence $\times \frac{1}{2}$; 2, spikelet; 3, spikelet with glumes removed;
 4, lower glume; 5, upper glume; 6, lower lemma; 7, palea of lowest lemma; all
 $\times 6$; 8, ligule $\times 1$.

Distribution: Bombay, endemic.

Exsicc.—*Bhide* s.n., Bombay.

- ✓ 8. ***Chloris roxburghiana*** Schult., Syst. Veg. 2, Mant. 339 (1827).
Ch. polystachya Roxb., Fl. Ind. 1, 332 (1820) non Lagasca (1816).
Ch. myriostachya Hochst. in Flora 38, 204 (1855).

Distribution: East Africa and Madras.

This is a common grass in Uganda, Tanganyika and other parts of Tropical East Africa.

Exsicc.—*Bourne* 1977, Pulneys; *Raju and Naganathan*, Coimbatore; *C. E. C. Fischer* 2713, ibidem.

There is a drawing of Roxburgh's *Chloris polystachya* in the collections at Kew, which leaves no doubt as to what his conception of this species was. The South Indian plant seems to be identical with the East African species.

- ✓ 9. ***Chloris virgata*** Sw., Fl. Ind. Occ. 1, 203 (1797).
Ch. pubescens Lagasca, Varied. Cienc. 2, 4, 143 (1805).
Rhabdochloa virgata (Sw.) P. Beauv., Ess. Agrost. 84, 158 (1812).
Chloris compressa DC., Cat. Hort. Monsp. 94 (1813).
Ch. elegans H.B.K., Nov. Gen. et Sp. 1, 166 (1816), t. 49.
Ch. alba J. S. Presl ex C. B. Presl, Rel. Haenk. 289 (1830).
Ch. caudata Trin. ex Bunge, Enum. Pl. Chin. Bor. 70 (1833).
Ch. meccana Hochst. et Steud., Syn. Pl. Glum. 1, 205 (1854).
Ch. penicillata Willd. ex Steud., Nom. Bot. 353 (1840) non Pers. (1805).

Distribution: Widely distributed throughout the tropics of both hemispheres. Remarkable from the fact that it is found at an altitude of 3500 m and also in the plains. The Tibetan specimens have much shorter spikes and may eventually turn out to be distinct. Duthie remarks concerning this grass: "This is one of the characteristic grasses of the saline or usar tracts of north-west India. It is reputed to be a good fodder grass." $2n = 20, 26, 40$.

Exsicc.—*H. Richardson* s.n., Tibet; *J. S. Gamble* 21028, Bombay; *J. F. Duthie* 6583, Etawah; *Meebold* 10495, Mysore.

10. ***Chloris wightiana*** Nees ex Steud., Syn. Pl. Glum. 1, 206 (1854).

Distribution: Seems to be confined to South India.

Exsicc.—*Barnes* s.n., Tinnevely; *Herb. Wight*. 1766, Madras.

Cynodon Rich. in Pers., Syn. Pl. 1, 85 (1805)

nomen genericum conservandum.

Capriola Adans. Fam. Pl. 2, 31 (1763).

Dactilon Vill., Hist. Pl. Dauph. 2, 69 (1787).

Fibichia Koel., Gram. Gall. et Germ. 308 (1802).

Key to the species of *Cynodon*

1. Culms stout, much branched, up to 1 m tall; inflorescence of several whorls of spikes on an elongate rhachis; glumes very short; lemma

- bristly on the margins; plant with stolons *C. plectostachyus*
1. Culms slender, creeping below, not more than 30 cm tall; inflorescence of digitate or umbellate spikes; glumes as long as or slightly shorter than the lemma; plants with widely spreading stolons and with or without rhizomes:—
 2. Lemmas longer than the upper glume:—
 3. Spikes 2–6, up to 6 cm long; plant rhizomatous; hairs on lemma not clavellate; ligule a ring of white hairs *C. dactylon*
 3. Spikes numerous and longer, up to 10 cm long, flexuous; plants not rhizomatous; hairs on lemmas sometimes clavellate; ligule membranous *C. arcuatus*
 2. Lemmas equal to, shorter or slightly longer than the upper glume; hairs on the lemma clavellate *C. barberi*

1. ***Cynodon arcuatus*** f. *S. Presl ex C. B. Presl*, Rel. Haenk. 1, 290 (1830).

C. intermedius Rang. et Tad. in J. Bombay Nat. Hist. Soc. 26, 304 (1918).

C. dactylon var. *intermedius* (Rang. et Tad.) C. E. C. Fischer in Gamble, Fl. Madras 1835 (1934).

Distribution: South India, Burma, South-east Asia, Malaya.

This species is commoner than it is thought to be as it is often confused with *Cynodon dactylon*. It differs, however, from that species by the absence of rhizomes and the possession of a membranous ligule.

Exsicc.—*N. L. Bor* 17088, Naga Hills; *Hook. f. et T. Thoms.* 213, Chittagong; *U Thein Lwin* 46, Burma; *Narayanaswami* 395, Madras.

✓ 2. ***Cynodon barberi*** Rang. et Tad. in J. Bombay Nat. Hist. Soc. 24, 846 (1916).

Distribution: Endemic to Madras.

This species is, according to the authors, closely allied to *Cynodon dactylon* but differs from it in the following respects: "The absence of stoloniferous underground branches (? presumably the authors mean rhizomes!); leaves short and not finely pointed; upper glume always equal to or longer than the lemma; presence of clavellate hairs on the keels and margins of the lemma and on the keels of the palea."

As there are no rhizomes, the habit of this plant must be quite different from that of *Cynodon dactylon*. Cattle are partial to this grass.

Exsicc.—*Madras Herb.* 13715, Madras; *Narayanaswami* 4603, Vizagapatam.

✓ 3. ***Cynodon dactylon*** (Linn.) Pers., Syn. Pl. 1, 85 (1805).

Panicum dactylon Linn., Sp. Pl. ed. 1, 58 (1753).

Digitaria dactylon (Linn.) Scop., Fl. Carn. ed. 2, 1, 53 (1772).

Dactilon officinale Vill., Hist. Pl. Dauph. 2, 69 (1787).

Paspalum dactylon (Linn.) Lamk., Tab. Encycl. Meth. Bot. 1, 176 (1791).

Digitaria littoralis Salisb., Prodr. Stirp. 19 (1796).

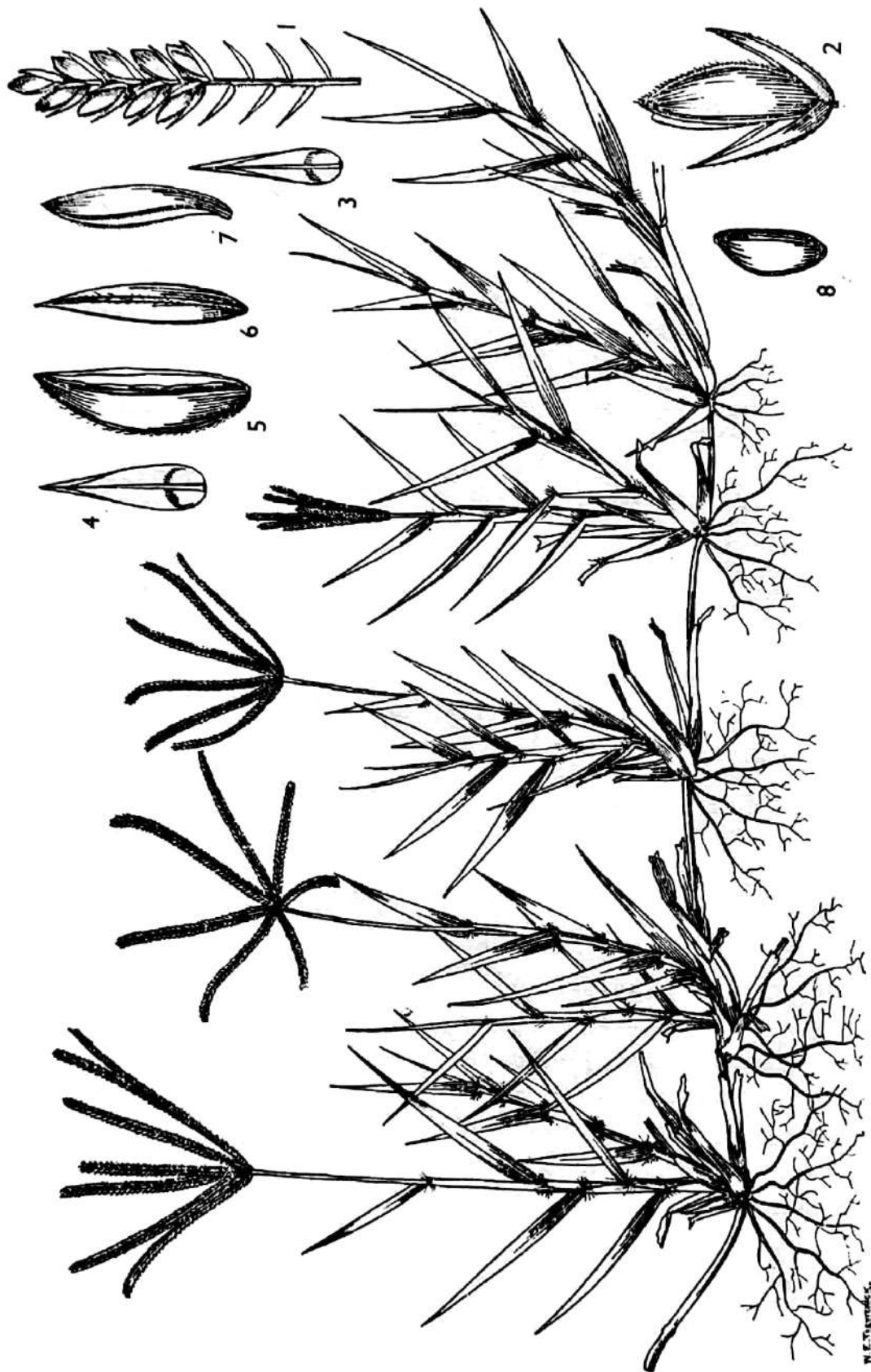


Fig. 52. *Cynodon dactylon* (Linn.) Pers.

Plant $\times 1$. 1, portion of spike with persistent lower glumes $\times 2$; 2, spikelet;
3, lower glume; 4, upper glume; 5 and 6, side and back views of lemma; 7, palea;
8, grain; all $\times 8$.

- Milium dactylon* (Linn.) Moench, Meth. Pl. Suppl. 67 (1802).
Fibichia umbellata Koel., Descr. Gram. 308 (1802).
Digitaria stolonifera Schrad., Fl. Germ. 1, 165 (1806).
Cynodon maritimus H.B.K., Nov. Gen. et Sp. 1, 170 (1816).
C. tenuis Trin. in Spreng., Neue Entd. 2, 63 (1821).
Chloris cynodon Trin., Gram. Unifl. 229 (1824).
Digitaria maritima (H.B.K.) Spreng., Syst. Veg. 1, 272 (1825).
Cynodon erectus J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 290 (1830).
Agrostis bermudiana Tussac ex Kunth, Enum. Pl. 1, 259 (1833).
A. filiformis Koen. ex Kunth, loc. cit. 261.
Cynodon occidentalis Willd. ex Steud., Nom. Bot. ed. 2, 1, 463 (1840).
C. portoricensis Willd. ex Steud., loc. cit.
Capriola dactylon (Linn.) O. Ktze., Rev. Gen. Pl. 2, 764 (1891).

Distribution: This is a grass with an extremely wide distribution, being found in all warm countries and even persisting in colder climates where, when the aerial parts are destroyed by severe frosts, the deep underground rhizomes persist unscathed.

It is esteemed as a lawn grass in this country. It can, however, only stand moderate grazing and will give way to coarser grasses with trampling and overgrazing. In Surinam it is recommended for clothing the banks between paddy fields so as to prevent harmful weeds in rice from breeding and so infesting the paddy fields. It forms a dense mat in which other weeds have little chance to establish themselves. It can, however, be on occasion a pestilential weed, hard to eradicate, as from even a small piece of a rhizome a complete plant will develop. Horses are particularly fond of this grass. It is as well to point out, however, that this species, in common with several other grasses, develops hydrocyanic acid, if allowed to wilt under certain conditions. $2n = 30, 36; 40$ (Tateoka).

Exsicc.—*Toppin* 227, Chitral; *Wenger* 253, Lushai Hills; *F. Ballard* 1162, Ceylon; *Nusker* 1180, Bengal; *U Thein Lwin* 4, Burma; *Jacquemont* s.n., Poona; *Bourne* 3151, Madras.

4. ***Cynodon plectostachyus*** (K. Schum.) Pilger in Engl., Jahrb. 40, 82 (1907).

Leptochloa plectostachya K. Schum. ex Engler, Pflanzenw. Ost-Afr. C, 112 (1895).

Distribution: Kenya and Tanganyika; introduced into India.

The various races of the species are widely used in Central Africa for pasture, hay and as soil-binders. The stolons interlace and spread widely, often up to 15 m from the parent plant.

Dichaetaria Nees ex Steud., Syn. Pl. Glum. 1, 145 (1854).

1. ***Dichaetaria wightii*** Nees ex Steud. Syn. Pl. Glum. 1, 145 (1854).
Gymnopogon rigidus Thw., Enum. Pl. Zeyl. 372, 444 (1864).

Distribution: South India and Ceylon.

This is apparently a forest grass and is found in deep shade.
Exsicc.—*Herb. Wight.* 1035, Madras; *Thwaites* C.P. 914, Ceylon.

Enteropogon Nees in Lindl., *Introd. Nat. Syst.*
ed. 2, 448 (1836).

1. **Enteropogon monostachyos** (Vahl) K. Schum. ex Engl. in Abh. Preuss. Akad. Wiss. 17 (1894), et in Pflanzenw. Ost-Afr. C, 110 (1895).

Cynosurus monostachyos Vahl, *Sym. Bot.* 2, 20 (1791).

Ischaemum melicoides Koenig ex Rottl. in Ges. Natur. Freunde Berlin, Neue Schr. 4, 211 (1803).

Leptochloa (?) *monostachya* Roem. et Schult., *Syst. Veg.* 2, 581 (1817).

Rottboellia pilosa Roth in Roem. et Schult., loc. cit. 785. (non Willd.)

R. triacantha Roth, Nov. Pl. Sp. 43 (1821).

Enteropogon melicoides (Koenig) Nees in Lindl., *Introd. Nat. Syst.* ed. 2, 449 (1886).

E. badamicus Bhide in Journ. et Proc. Asiat. Soc. Beng. n.s., 7, 517 (1912).
Distribution: South India, Ceylon, Burma.

I have tried in vain to find some reliable character whereby *E. badamicus* may be separated from *E. monostachyos* and have been compelled to treat them as one species. The grass is said to grow in deciduous forests. As the name indicates, this species is often characterized by an inflorescence which usually consists of a single raceme, but inflorescences with 2-5 racemes have been recorded [see Chandrasekharan et Saktharam Rao in *J. Bomb. Nat. Hist. Soc.* 49, 578 (1950)]. $2n = 20$.

Exsicc.—*Collett* s.n., 26, Burma; *Bhide* s.n., Bombay (type of *E. badamicus*); *Barber* 3504, Madras.

Gymnopogon P. Beauv., *Essai Agrost.* 41 (1812),
t. 9, fig. 3.

Anthopogon Nutt., *Gen. Am.* 1, 81 (1818).

Biatherium Desv., *Opusc.* 72 (1831).

1. **Gymnopogon delicatulus** (C. B. Clarke) Bor, comb. nov.
Chloris delicatula C. B. Clarke ex Hook. f., *Fl. Brit. Ind.* 7, 290 (1896).

Distribution: Central India and Burma.

Exsicc.—*J. H. Lace* 5007, Burma; *C. B. Clarke* 33855, Hazaribagh.

Melanocenchris Nees in Proc. Linn. Soc. 1, 94 (1841).

Ptiloneilema Steud., *Syn. Pl. Glum.* 1, 201 (1854).

Gracilea Koen. ex Rottl. in Ges. Natur. Freunde Berlin, Neue Schr. 4, 218 (1803).

Roylea Nees ex Steud. *Nom. Bot.* ed. 2, 2, 475 (1841).

The name *Gracilea* was first published by Rottler in loc. cit. in synonymy under *Pommereulla monoica*. The generic name *Gracilea* has therefore no validity.

Key to the species of *Melanocenchris*

1. Annual; leaves convolute, very narrow, not aggregated at the base:—
2. Clusters of spikelets including the awns, 8 mm long

M. jacquemontii

2. Clusters of spikelets including the awns, 10 mm or more long

M. abyssinica

1. Perennial; leaves flat, linear or lanceolate, mostly aggregated at the base

M. monoica

1. ***Melanocenchris abyssinica* (R.Br.) Hochst.** in Flora 38, 274 (1855) in obs.

Eutriana abyssinica R.Br. ex Fresen. in Mus. Sencken. 2, 142 (1837).*Melanocenchris plumosa* Jaub. et Spach, Ill. Pl. Or. 4, 37 (1851).*Pennisetum plumosum* Hochst. ex Steud., Syn. Pl. Glum. 1, 201 (1854).*Ptiloneilema plumosum* Steud., loc. cit. 201.*Gracilea royleana* Hook. f. var. *plumosa* Hook. f., Fl. Brit. Ind. 7, 284 (1896).

Distribution: North-west India, Arabia to north-east Tropical Africa.

Exsicc.—*J. F. Duthie* 5096, Punjab; *N. Dalzell* s.n., Bombay; *Stocks* s.n., Sind.

- ✓ 2. ***Melanocenchris jacquemontii* Jaub. et Spach**, Ill. Pl. Or. 4, 36 (1851).

Gracilea royleana Hook. f., Fl. Brit. Ind. 7, 284 (1896).*Melanocenchris royleana* Nees in Proc. Linn. Soc. 1, 95 (1841) nomen.

Distribution: Bengal, Bombay State, Sind, north-west India.

This species grows in small tufts often in the most inhospitable of habitats, e.g. in cracks in rocks in full sunlight.

Exsicc.—*H. Santapau* 19348, Dangs; *Stocks* s.n., Sind; *Mokim* 1368, Gaya;*J. S. Gamble* 17760, Madras; *Jacquemont* 239, Poona.

3. ***Melanocenchris monoica* (Rottl.) C. E. C. Fisch.** in Gamble, Fl. Madras, 1831 (1934).

Pomereulla monoica Rottl. in Ges. Natur. Freunde Berlin, Neue Schr. 4, 218 (1803).*Gracilea nutans* Koenig ex Rottl. loc. cit. 218.*Melanocenchris perrottetii* Jaub. et Spach, Ill. Pl. Or. 4, 38 (1851).*M. rothiana* Nees in Proc. Linn. Soc. 1, 95 (1841).

Distribution: Madras, Ceylon.

Exsicc.—*J. S. Gamble* 12682, Madras; *Bourne* 3592, Madras.***Microchloa* R.Br.**, Prod. Fl. Nov. Holl. 208 (1810).Key to the species of *Microchloa*

1. Annual

M. indica

1. Perennial

M. kunthii

- ✓ 1. ***Microchloa indica* (Linn. f.) P. Beauv.**, Ess. Agrost. (1812) Explic. Planch. 20.

Nardus indica Linn. f., Suppl. 105 (1781).

Rottboellia setacea Roxb., Cor. Pl. 2, 17 (1798), t. 132.

Microchloa setacea R.Br., Prodr. 208 (1810).

Distribution: Madras, Central India, Malaya, East and West Africa, South America.

Very often a pioneer on cleared soil.

Exsicc.—*Meebold* 11169, Madras; *A. E. Lowrie* 9974, Central India; *H. F. Mooney* 3099, Orissa; *Mokim* 1347, Gaya.

2. ***Microchloa kunthii*** Desv., Opusc. 75 (1831).

M. elongata R.Br. in Wall. Cat. no. 3807 (1831).

Paspalum tenuissimum Jones, West. Bot. Contrib. 18, 24 (1935).

Distribution: North-eastern India, Madras Hills, China, Malaya, Tropics of Africa and South America.

Exsicc.—*C. B. Clarke* 38901, Khasia; *Abdul Khalil* s.n., Burma; *Bourne* 1971, Pulneys; *N. L. Bor* 16012, Naga Hills.

***Oropetium* Trin., Fund. Agrost. 98 (1820), t. 3.**

Key to the species of *Oropetium*

1. Lemmas hirsute; spikes 1.5 cm long; spikelets 1–1.5 mm long

O. villosulum

1. Lemmas glabrous; spikes 2–5 cm long; spikelets 1.5–2 mm long

O. thomaeum

✓ 1. ***Oropetium thomaeum*** (Linn. f.) Trin., Fund. Agrost. 98 (1820), t. 3.

Nardus thomaea Linn. f., Suppl. 105 (1781).

Rottboellia thomaea (Linn. f.) Koenig in Naturf. 23, 210 (1788).

Distribution: South-east Asia, Ceylon, Burma, Tropical Africa.

Exsicc.—*J. S. Gamble* 17757, Madras; *F. Ballard* 1458, Ceylon.

✓ 2. ***Oropetium villosulum*** Stapf ex Bor in Kew Bull. 1949, 571 (1950).

Distribution: Orissa, Central India, Bombay.

Found in very arid habitats, such as the cracks in exposed rocks, or in sand.

Exsicc.—*H. F. Mooney* 3560, Sambalpur; *J. F. Duthie* 8523, Madhya Pradesh; *Jacquemont* 343, Bombay.

***Schoenefeldia* Kunth, Rév. Gram. 1, 283 (1830), t. 53.**

✓ 1. ***Schoenefeldia gracilis*** Kunth, Rév. Gram. 1, 283 (1830), t. 53.

✓ *Schoenefeldia pallida* Edgew. in J. Asiat. Soc. Beng. 21, 183 (1852).

Chloris pallida (Edgew.) Hook. f., Fl. Brit. Ind. 7, 289 (1896). *Lisbow*

Ch. myosuroides Hook. f., loc. cit. 290.

Distribution: Bundelkhand, Bihar, Central India and Western Peninsula and Tropical Africa.

A small annual which, according to Blatter, is gregarious in dry sandy places.

Hook. f. keeps *Chloris pallida* and *Ch. myosuroides* as separate species in the *Flora of British India*, but there is little doubt that the latter is a depauperate state of the former.

Exsicc.—J. F. Duthie 6579, Bundelkhand; Saxton 537, Gujarat; J. F. Duthie 4960, Gangetic Plain.

Tetrapogon Desf., Fl. Atlant. 2, 388 (1799), t. 255.

Key to the species of *Tetrapogon*

- | | |
|--|--------------------|
| 1. Lemmas covered with long fine hairs | <i>T. villosus</i> |
| 1. Lemmas glabrous | <i>T. tenellus</i> |

- ✓ 1. **Tetrapogon tenellus** (Roxb.) Chiov. in Ann. Ist. Bot. Roma 8, 352 (1908).

Chloris tenella Roxb., Fl. Ind. 1, 330 (1820). *Listoa*

Ch. triangulata Hochst. ex A. Rich., Tent. Fl. Abyss. 2, 409 (1851).

Ctenium indicum Spreng., Syst. Veg. 1, 274 (1825).

Tetrapogon triangularis (Hochst.) Hochst., Pl. Arab. Schweinf. no. 967, vide Hook. f., Fl. Brit. Ind. 7, 291 (1896).

Distribution: North-west and South India, westwards to Arabia and East Tropical Africa.

This is said to be a useful fodder grass.

Exsicc.—R. N. Parker 3447, Punjab; J. F. Duthie s.n., Rajputana; Dalzell s.n., Bombay; Bourne 3593, Madras.

2. **Tetrapogon villosus** Desf. Fl. Atlant. 2, 389 (1799), t. 255.

Chloris villosa (Desf.) Pers., Syn. Pl. 1, 87 (1805).

Ch. tetrapogon P. Beauv., Ess. Agrost. 158 (1812).

Distribution: North-west India to North Africa.

Exsicc.—R. R. Stewart 12508, Rawalpindi; Harsukh 14969, Kurram Valley.

Trichloris Fourn. ex Benth. in J. Linn. Soc. (Bot.) 19, 102 (1881).

Key to the species of *Trichloris* (after Chase)

- | | |
|--|----------------------|
| 1. Spikelets 2-flowered; both lemmas with 3 long awns | <i>T. crinita</i> |
| 1. Spikelets 3–5-flowered; the lateral awns of the lemmas more or less reduced, sometimes obsolete | <i>T. pluriflora</i> |

1. **Trichloris crinita** (Lag.) Parodi in Rev. Argent. Agron. 14, 63 (1947).

Chloris crinita Lag. in Var. Cienc. 4, 143 (1805).

Ch. mendocina R. A. Phil. in Ann. Univ. Chile 36, 208 (1870).

Trichloris blanchardiana Fourn. ex Scribn. in Bull. Torr. Bot. Club 9, 146 (1882).

POOIDEAE—DANTHONIEAE

DANTHONIEAE (Nevski in Act. Inst. Bot. Acad. Sci. U.R.S.S., ser. 1, fasc. 4, 223 (1937)) *see also 1973.*

Spikelets 2–10-flowered, all alike, hermaphrodite, uppermost florets reduced; rhachilla disarticulating above the glumes and between the florets, produced and crowned with a rudimentary floret. Glumes equal or subequal to or longer than the lowest lemma, hyaline to scarious or subherbaceous, 3–11-nerved; lemmas firmly membranous to coriaceous, 5–11-nerved, more or less hairy, 2- or 3-lobed, awned in the sinus or the middle lobe awned; lobes aristate or not; awn geniculate, with a twisted column; palea 2-keeled, hyaline, as long as the lemmas or shorter. Lodicles 2, large or small. Stamens 3, sometimes minute. Ovary glabrous; styles 2, slender, long. Grain oblong, obovoid or ellipsoid; hilum obscure, linear. Starch-grains compound.

Perennials rarely annuals; leaf-blades narrowly linear or setaceous, rolled or flat, with festucoid anatomy; silica cells rounded or dumb-bell-shaped; micro-hairs slender, 2-celled. Spikelets arranged in panicles, racemes or spikes. Ligule a fringe of hairs.

Chromosomes small; basic numbers 6, 9.

<i>Genera:</i>	<i>Asthenatherum</i>	<i>Massia</i>
	<i>Danthonia</i>	<i>Schismus</i>
	<i>Danthonidium</i>	<i>Zenkeria</i>
	<i>Eriachne</i>	

Key to the genera of **Danthonieae**

1. Spikelets 1-flowered; rhachilla produced as a flattened spatulate structure; lemma 2-lobed at the tip, with a very stout awn from between the lobes; lobes awned **Danthonidium**
1. Spikelets 2–several-flowered:—
 2. Spikelets more than 2-flowered:—
 3. Lemmas notched or minutely 2-lobed, awnless **Schismus**
 3. Lemmas 2-lobed, awned; awn perfect, issuing between the two lobes:—
 4. Glumes prominently 7–11-nerved, chartaceous, scabrid; lemmas densely short-hairy between the nerves **Asthenatherum**
 4. Glumes not prominently nerved, rather thin; lemmas not short-hairy between the nerves **Danthonia**
 2. Spikelets strictly 2-flowered; rhachilla not produced or only as a small point:—
 5. Palea with 2 long awns; lemma shortly hairy on the back, long-awned **Massia**
 5. Palea awnless:—

6. Leaves flat; glumes spreading, ovate, about half the length of the lemmas; lemmas membranous, obtuse or acuminate, not awned **Zenkeria**
6. Leaves setaceous, convolute; glumes not spreading, nearly as long as or longer than the lemmas; lemmas coriaceous, acute, awned **Eriachne**

Asthenatherum Nevski in Act. Univ. As. Med.
sér. 8b, Bot. Fasc. 17, 8 (1934).

1. **Asthenatherum forsskalii** (Vahl) Nevski in Act. Univ. As. Med.
sér. 8b, Bot. Fasc. 17, 8 (1934).

Avena forsskalii Vahl, Symb. Bot. 2, 25 (1791).

Danthonia forsskalii (Vahl) R.Br. in Denh. & Clapp., Narr. Trav.
North and Centr. Afr., App. 244 (1826).

Distribution: Orient, North Africa, North-west India, North Tropical Africa, South-west Africa.

A desert species. The long stout roots are covered with fine root hairs to which fine sand grains adhere, giving the roots a velvety appearance. Exsicc.—*H. Santapau* s.n., Baluchistan.

Danthonia DC. in Lamk. et DC., Fl. Fr. 3, 32 (1805).

Merathrepta Rafin. in Sér. Bull. Bot. 1, 221 (1830).

Key to the species and varieties of *Danthonia*

1. Slender grass; panicles very short, congested; anthers 1.25–1.5 mm long; lemma with tufts of hairs between the nerves at the base of the lobes ***D. cachemyriana***
1. Robust grasses; panicles long, congested or racemose; anthers 3.5–5 mm long; lemmas hairy on the margins:—
2. Glumes 18–25 mm long ***D. jacquemontii* var. *jacquemontii***
2. Glumes 15 mm or less long ***D. jacquemontii* var. *minor***

1. ***Danthonia cachemyriana* Jaub. et Spach**, Ill. Pl. Or. 4, 46 (1851), t. 331.

D. exilis Hook. f., Fl. Brit. Ind. 7, 281 (1896).

Distribution: North-west Himalaya, 2500–3500 m.

Not of any account as a fodder grass but eaten by sheep and goats. It grows in the fissures of rocks.

Exsicc.—*J. F. Duthie* 13616, Kashmir; *N. L. Bor* 16625, Lahul.

- see added 2. ***Danthonia (jacquemontii) schneidei* Bor** in Kew Bull. 1952, 80 (1952).

D. cachemyriana of the Fl. Brit. Ind. 7, 281 (1896) non Jaub. et Spach (1851).

var. ***jacquemontii***.

Distribution: Himalaya from Bashahr to Sikkim, 2000–4500 m.
Of no account as fodder.

Exsicc.—*N. L. Bor* s.n., Lahul; *J. F. Duthie* 266, Garhwal; *Hook. f.* s.n., Sikkim.

var. **minor** (*Hook. f.*) *Bor* in Kew Bull. 1952, 81 (1952).

D. cachemyriana *Hook. f.* var. *minor* *Hook. f.*, Fl. Brit. Ind. 7, 282 (1896).

D. cumminsii *Hook. f.*, loc. cit. 282.

Distribution: Himalaya from Kashmir eastwards to Lachoong, 3000–4800 m.

Of no account as fodder.

Exsicc.—*R. R. Stewart* 10474, Kashmir; *Hook. f.* s.n., Sikkim.

Danthonidium *C. E. Hubbard* in *Hook.*, Ic. Pl. (1937) tab. 3331.

✓ 1. **Danthonidium gammiei** (*Bhide*) *C. E. Hubbard* in *Hook.* Ic. Pl. sub tab. 3331 (1937).

Danthonia gammiei *Bhide* in J. Proc. Asiat. Soc. Beng. 1911, n.s. 7, 513, 51 (1912), t. 6.

Distribution: Seems to be confined to Bombay State, having been collected in North Kanara at Castle Rock and in the National Park at Borivli and at Kankeri.

Exsicc.—*Gammie* A48, North Kanara; *R. R. Fernandez* R1909, Borivli National Park, Bombay; *Sedgwick & Bell*, Mirjan Flats, Bombay.

Eriachne *R.Br.*, Prodr. 183 (1810).

1. **Eriachne pallescens** *R.Br.* Prodr. 184 (1810).

Aira chinensis *Retz.*, Obs. Bot. 3, 10 (1783).

Eriachne chinensis *Hance* in Ann. Sc. Nat. Bot. sér. 4, 15, 228 (1861).

E. hookeri *Munro* in J. Linn. Soc. (Bot.) 6, 42 (1861) nomen.

Tricholaena chinensis (*Retz.*) *Domin* in Bibl. Bot., Heft 85, 327 (1915).

Distribution: China, Eastern India, Burma, Malaya, Siam and Australia.

This species must be commoner in India than the collections suggest.

It is probably of no account as a fodder.

Exsicc.—*Hook. f. et T. Thoms.* s.n., Chittagong; *S. Kurz* s.n., Nicobars.

The types of *Eriachne chinensis* *Hance* and *Aira chinensis* *Retz.* have been seen; they are based upon different specimens of the same species. The epithet *chinensis* would be a later homonym and illegitimate in *Eriachne*. Robert Brown's epithet *pallescens* is, therefore, the correct name for the species.

Massia *Balansa* in *Morot*, J. de Bot. 4, 165 (1890).

1. **Massia trisetata** (*Nees*) *Balansa* in *Morot*, J. Bot. Paris 4, 165 (1890).

Eriachne trisetata *Nees* ex *Steud.*, Syn. Pl. Glum. 1, 237 (1854).

Megalachne zeylanica *Thwaites*, Enum. Pl. Zeyl., 372, 444 (1864).



Fig. 53. *Danthonidium gammiei* (Bhide) C. E. Hubb.
 1, plant $\times \frac{1}{2}$; 2, spikelet from the side; 3, upper glume $\times 6$;
 5, palea of the floret with the spathulate rhachilla lying on its adaxial surface $\times 6$;
 6, rhachilla $\times 40$; 7, lemma $\times 6$.

Distribution: Burma, Ceylon, extending to South-east Asia.

This wiry perennial grows in open savannah or in partial shade. It is often a common grass in coconut plantations near the sea. It is considered by some authors to be congeneric with *Eriachne*, but the strongly 2-awned palea is very peculiar and unique in the tribe.

Exsicc.—*Griffith* s.n., Mergui; *Thwaites* C.P. 3247, Ceylon.

Schismus *P. Beauv.*, Ess. Agrost. 73 (1812), t. 15, f.4.

Key to the species of *Schismus*

1. Spikelet viewed from the side shows lobes of the lemma acuminate; palea rounded at the tip, shorter than the lemma *S. arabicus*
1. Spikelet viewed from the side shows lobes of the lemma acute; palea acute, almost as long as the lemma *S. barbatus*

1. **Schismus arabicus** *Nees*, Fl. Afr. Austr. 422 (1841).

S. marginatus of the Fl. Brit. Ind. 7, 336 (1896) non *P. Beauv.* (1812).

Distribution: Mediterranean Region to north-west India, Australia.

Exsicc.—*R. R. Stewart* 23340, Pakistan; *C. B. Clarke* 30006, Skardo, Kashmir; *Stocks* s.n., Baluchistan; *J. H. Lace* 3318, Kila Abdulla, Baluchistan.

2. **Schismus barbatus** (*Linn.*) *Thell.* in Bull. Herb. Boiss. sér. 2, 7, 391 (1907).

Festuca barbata *Linn.*, Amoen. Acad. 3, 400 (1756).

F. calycina *Loefl.*, Iter Hisp. 116 (1758).

Schismus calycinus (*Linn.*) *Duval-Jouve* in Billot, Annot. 289 (1855).

S. fasciculatus *P. Beauv.*, Ess. Agrost. 74 (1812), t. 15.

S. brevifolius *Nees*, Fl. Afr. Austr. 422 (1841).

Distribution: Mediterranean Region to north-west India, Central Asia, South Africa, introduced into North America, Australia and Argentine.

This species grows in areas of low rainfall and is of use in such places, where little else is available for grazing.

Zenkeria *Trin.* in Linnaea 11, 150 (1837), tab. 3.

Key to the species of *Zenkeria*

1. Glumes shorter than half the lemmas; lemmas acuminate; spikelets 4.5 mm long; leaves not more than 6 mm broad *Z. elegans*
1. Glumes equal to or longer than half the lemmas; lemmas obtuse or acuminate:—
 2. Leaves flat, 20 mm broad; spikelets 3–3.25 mm long; lemmas obtuse *Z. obtusiflora*
 2. Leaves involute, at most 6 mm broad; spikelets 3.5–4 mm long; lemmas acuminate *Z. stapfii*

POOIDEAE—EHRHARTEAE

EHRHARTEAE *Nees* in Act. Inst. Bot. Acad. Sci. U.R.S.S., ser. 1, fasc. 4, 227 (1937)

Spikelets 3-flowered with the 2 lower florets reduced to the lemmas, the uppermost hermaphrodite. Glumes equal or unequal, usually shorter than the spikelet; rachilla disarticulating above the glumes, not between the florets. Sterile lemmas awned or awnless, varying in size, equal or unequal, one or both ridged, wrinkled or flanged, the upper of the two often with a basal appendage; fertile lemma slightly to much shorter; palea 2-nerved, 2-keeled; keels close together. Stamens 6, 3 or 1. Styles 2; stigmas plumose. Grain elliptic, compressed; hilum linear, almost the length of the grain; embryo small; starch-grains compound.

Annual or perennial grasses. Leaf-blades linear to lanceolate, flat or rolled, sometimes much reduced, with festucoid anatomy; 2-celled micro-hairs present, elongated; silica-cells cross-shaped, nodular or dumb-bell-shaped. Ligules membranous. Inflorescence a panicle or raceme.

Chromosomes small; basic number 6.

Genus: Ehrharta

Ehrharta *Thunb.* in Vet. Acad. Handl. Stockh. 216

(1779), t. 8, nomen genericum conservandum.

Trochera L. C. Rich., J. Phys. Paris 13, 225 (1779), t. 3.

Key to the species of *Ehrharta*

1. Culms tufted, erect, bulbous at the base; lower empty lemma smooth or rugulose below, upper very strongly rugulose or flanged; spikelets 10–12 mm long, not awned *E. capensis*
1. Culms not bulbous at the base; upper lemma sometimes rugulose but not flanged; spikelets long-awned, mucronate or not awned:—
 2. Sterile lemmas lanceolate, produced into a subulate scabrid awn or beak sometimes as long as the lemmas; lower lemma 6 mm, the upper 7 mm long *E. longiflora*
 2. Sterile lemma not produced into a beak or subulate scabrid awn:—
 3. Spikelets 7–8 mm long; empty lemmas silkily villous, the upper mucronate *E. calycina*
 3. Spikelets 3–5.5 mm long; empty lemmas not villous, nor mucronate:—
 4. Spikelets 3–3.5 mm long; upper sterile lemma always distinctly rugose; lemmas obtuse in profile, smooth and glabrous *E. erecta*
 4. Spikelets 5.5 mm long; upper sterile lemma usually not rugulose, smooth or very scabrid; lemmas acute in profile *E. abyssinica*

POOIDEAE—ERAGROSTEAE

ERAGROSTEAE *Stapf* in Dyer, Flor. Cap. 7, 316 (1898)

Spikelets 2- to many-flowered, hermaphrodite, usually strongly laterally compressed, rarely terete; rhachilla disarticulating above the glumes and the spikelets breaking up from above downwards, or somewhat tough and the glumes and lemmas falling from below upwards in succession. Glumes sometimes persistent, membranous to coriaceous, usually shorter than the lemmas; lemmas exserted from the glumes, membranous to chartaceous, not becoming firmer at maturity, 1-3-nerved, emarginate or 2-4-lobed at the tip, awnless, mucronate or with a straight awn from the tip or sinus, rarely with the three nerves running out as awns; paleas hyaline, 2-nerved, 2-keeled, occasionally winged on the keels which are scabrid or rarely ciliate, usually caducous, rarely persistent. Lodicules 2. Stamens 2 or 3. Grain sometimes with a free pericarp, loosely or tightly enclosed between the lemma and palea; hilum punctiform, oblong or ellipsoid; embryo about half the length of the grain; starch-grains compound.

Annual or perennial herbs. Leaf-blades narrow, often setaceous, with panicoid anatomy; micro-hairs 2-celled, swollen, club-shaped; silica-cells saddle-shaped; ligule a ciliate rim, rarely membranous. Spikelets pedicelled in open or contracted panicles, or sessile or subsessile in secund spikes or spike-like racemes.

Chromosomes small; basic number 9, 10.

<i>Genera:</i>	<i>Acrachne</i>	<i>Eragrostiella</i>
	<i>Cleistogenes</i>	<i>Eragrostis</i>
	<i>Coelachyrum</i>	<i>Halopyrum</i>
	<i>Dactyloctenium</i>	<i>Leptochloa</i>
	<i>Desmostachya</i>	<i>Myriostachya</i>
	<i>Dinebra</i>	<i>Neyraudia</i>
	<i>Diplachne</i>	<i>Orinus</i>
	<i>Eleusine</i>	<i>Tripogon</i>
	<i>Elytrophorus</i>	

Key to the genera of **Eragrosteae**

(after C. E. Hubbard)

1. Lemmas usually entire at the apex, obtuse, acute or acuminate or if 2-toothed (*Acrachne*) or awned from the tip (*Elytrophorus*) then glabrous near the margins and along the side nerves; cleistogamous spikelets not developed in the axils of the leaf-sheaths:—
2. Glumes aristate or aristate-acuminate:—
3. Spikelets pedicelled on the short angular branches of a narrow elongated panicle, many-flowered **Myriostachya**

3. Spikelets sessile on the flattened branches of a narrow panicle, 2-3-flowered **Dinebra**
2. Glumes obtuse, acute or acuminate, rarely the upper awned and the spikelets then in digitate spikes or a short raceme of spikes (*Dactyloctenium*):—
4. Internodes of the rhachilla bearded at the tip with long hairs up to half the length of the lemma; spikelets subsessile or short-pedicelled on the erect branches of a contracted elongated panicle **Halopyrum**
4. Internodes of the rhachilla glabrous or only shortly hairy:—
5. Spikelets in open, contracted or spike-like panicles, rarely in solitary secund spikes (*Eragrostiella*):—
6. Spikelets awnless:—
7. Inflorescence a panicle, sometimes spike-like:—
8. Lemmas rounded on the back, 3-5-nerved; grain hollowed out on the adaxial surface, rugose on the other **Coelachyrum**
8. Lemmas more or less acutely keeled, 3-nerved; grain not rugose or hollowed out on the adaxial surface **Eragrostis**
7. Inflorescence a solitary secund spike **Eragrostiella**
6. Spikelets awned, in dense globose clusters **Elytrophorus**
5. Spikelets sessile or very short-pedicelled, loosely to densely imbricate in digitate or racemosely arranged spikes or spike-like racemes, very rarely in solitary spikes (*Eleusine* sp.):—
9. Lemmas glabrous, keeled; spikelets closely to densely imbricate, biseriate:—
10. Axis and branches of the inflorescence ending in a spikelet:—
11. Spikelets falling entire at maturity from the axis of straight spikes, the latter numerous and crowded into a long narrow dense panicle; glumes 1-nerved **Desmostachya**
11. Spikelets breaking up at maturity; spikes few to several:—
12. Spikes digitate or subdigitate; spikelets 3-6-flowered; glumes 1-5-nerved; grain oblong to globose, grooved, with a loose conspicuous pericarp **Eleusine**
12. Spikes usually in pseudo-whorls or scattered; spikelets 8-20-flowered; grain coarsely rugose, grooved or hollowed on one face, with an early deciduous pericarp **Acrachne**
10. Axis of spikes terminating in a sharp point; upper glume mucronate or awned; spikes digitate, rarely racemose **Dactyloctenium**
9. Lemmas softly villous all over; spikelets loosely imbricate in loosely panicked racemes **Orinus**

1. Lemmas usually emarginate or 2-4-lobed or toothed at the apex, rarely entire and then hairy along the nerves, frequently mucronate or awned; cleistogamous spikelets sometimes developed in the sheaths:—
13. Spikelets in panicles or in digitate or racemosely arranged spike-like racemes:—
14. Joints of the rhachilla one-third to one-half as long as the lemmas; cleistogamous spikelets occasionally developed in the axils of the sheaths; florets exerted from the glumes **Cleistogenes**
14. Joints of the rhachilla much shorter; cleistogamous spikelets not developed, or, if so, then glumes longer than rest of the spikelet:
15. Spikelets in slender, more or less secund, racemosely arranged racemes; low grasses:—
16. Racemes loosely spiculate; spikelets linear-oblong, subterete; lemmas more or less rounded on the back **Diplachne**
16. Racemes densely spiculate, conspicuously secund; spikelets oblong, laterally compressed; lemmas keeled **Leptochloa**
15. Spikelets in loose or contracted panicles; stout reed-like grasses with large plume-like panicles **Neyraudia**
13. Spikelets in terminal solitary secund spikes **Tripogon**

Acrachne Wight. et Arn. in Lindley, Intro. Nat. Syst.
ed. 2, 381 (1836) nomen et ex Chiov. in Ann.
Ist. Bot. Roma, 8, 361 (1908).

- ✓ 1. **Acrachne racemosa** (Heyne) Ohwi in Bull. Tokyo Sci. Mus. n. 18, 1 (1947).

Eleusine racemosa Heyne ex Roem. et Schult., Syst. Veg. 2, 583 (1817);
Roth, Nov. Pl. Spec. 80 (1821).

E. verticillata Roxb., Fl. Ind. 1, 346 (1820).

Leptochloa racemosa (Heyne) Kunth, Rév. Gram. 1, 91 (1829).

L. verticillata (Roxb.) Kunth, loc. cit. 91.

Acrachne verticillata (Roxb.) Lindley ex Chiov. in Ann. Istit. Bot.
Rom. 8, 361 (1908).

Distribution: Tropical Africa, South-east Asia, Ceylon and Australia.
 $2n = 36$.

Exsicc.—R. R. Stewart 9647, Hazara; J. R. Drummond 21317, Punjab;
C. A. Barber 4563, Madras; Abdul Huk 124, Burma; Trimen s.n., Ceylon.
Marathwada.

Cleistogenes Keng in Sinensia 5, 147 (1934).

1. **Cleistogenes gatacrei** (Stapf) Bor, comb. nov.

Diplachne gatacrei Stapf in Kew Bull. 1898, 229 (1898).

Distribution: North-west India.

Exsicc.—Gatacre 17626, Chitral; R. R. Stewart 24516, Swat State.

Coelachyrum Hochst. et Nees in *Linnaea* 16, 221 (1842).Key to the species of *Coelachyrum*

1. Inflorescence compact, often globular, or at least the spikelets congested upon a short rhachis; lemmas bearded on keel and side nerves; anthers minute
1. Inflorescence not compact, open; the spikelets spaced on the branches; lemmas not bearded on the keel and side nerves; anthers over 1 mm long

*C. lagopoides**C. piercei*

1. **Coelachyrum lagopoides** (Burm. f.) Senaratna, *Grasses of Ceylon*, 79 (1956).

Cynosurus lagopoides Burm. f., *Fl. Ind.* 29 (1768).*Dactylis brevifolia* Willd., *Sp. Pl.* 1, 410 (1798).*Koeleria brevifolia* (Willd.) Spreng., *Pugill.* 2, 21 (1815).*Aeluropus laevis* Trin., *Fund. Agrost.* 143 (1820), t. 12.*Poa brevifolia* (Willd.) Kunth, *Rév. Gram.* 1, 111 (1829).*Coelachyrum indicum* Hack. in Engl. et Prantl, *Natürl. Pflanzenf.* 2, 2, 61 (1887).*Eragrostis brevifolia* (Willd.) Benth. in Hook., *Icon. Pl.* 14, 51 (1881) in adnot.*Eleusine brevifolia* (Willd.) R.Br. ex Hook. f., *Fl. Brit. Ind.* 7, 294 (1896).*E. lagopoides* (Burm. f.) Merr. in *Philipp. J. Sci.* 19, 339 (1921).

Distribution: On the coasts of South India and in arid areas in Ceylon. Exsicc.—*C. A. Barber* 4614, Madras; *C. E. C. Fischer* 4169, Madras. Senaratna reports this species from Ceylon—there are no specimens from this area at Kew.

2. **Coelachyrum piercei** (Benth.) Bor in *Kew Bull.* 1952, 226 (1952).

Eragrostis piercei Benth. in Hook., *Icon. Pl.*, 52 (1881), t. 1370.

Distribution: Coast of Baluchistan.

Exsicc.—*E. Pierce* s.n., Baluchistan.**Dactyloctenium** Willd., *Enum. Hort. Berol.* 1029 (1809).Key to the species of *Dactyloctenium*

1. Spikes arranged racemosely on an axis
1. Spikes arranged digitately:—
 2. Annuals:—
 3. Stoloniferous; spikes 2–5 cm long; tip of the rhachis shortly produced, up to 2 mm long
 3. Not stoloniferous; spike 0.5–2 cm long; tip of the rhachis up to 4 mm long
 2. Perennials; back of the rhachis keeled or grooved on each side of the keel:—

*D. henrardianum**D. aegyptium**D. aristatum*

4. Spikes 2-4 cm long; plants green; leaves up to 12 cm long, flaccid; back of rhachis keeled
D. australe
 4. Spikes 0.5-2 cm long; plants glaucous; leaves 2.5-4 cm long, stiff; back of rhachis with a slit-like groove on each side of the keel
D. indicum

✓ 1. ***Dactyloctenium aegyptium* (Linn.) P. Beauv., Ess. Agrost. Expl. Pl. 15 (1812).**

Cynosurus aegyptius Linn., Sp. Pl. ed. 1, 72 (1753).

Eleusine aegyptia (Linn.) Desf., Fl. Atlant. 1, 85 (1798).

Eleusine pectinata Moench, Meth. Pl. Suppl. 68 (1802).

Chloris mucronata Michx., Fl. Bor. Amer. 1, 59 (1803).

Dactyloctenium aegyptiacum Willd., Enum. Pl. Hort. Berol. 1029 (1809).

Dactyloctenium mucronatum Willd., loc. cit. 1029.

Distribution: Tropical regions of the Old World, introduced into America.

This grass is said to be rich in cyanogenetic glycosides and therefore is a danger to stock at certain times. The grain is used in India and Africa as a food-grain in times of want, but is said to have an unpleasant taste and to cause internal disorders. $2n = 20, 36, 48$.

Exsicc.—F. Ballard 1479, Ceylon; Po Khant 13424, Burma; Jacquemont 399, Poona; Griffith 6616, Afghanistan; Bourne 3159, Madras.

✓ 2. ***Dactyloctenium aristatum* Link, Hort. Berol. 1, 59 (1827).**

Distribution: North-east Africa to north-west India.

There is one specimen of this plant at Kew, which according to Drummond is found on hard loam desert soil in north-west India and is usually passed over as *D. indicum* or a dwarf state of *D. aegyptium*.

Exsicc.—J. F. Duthie 7699, Aligarh.

✓ 3. ***Dactyloctenium australe* Steud., Syn. Pl. Glum. 1, 212 (1854).**

Distribution: South Africa but introduced in other tropical countries, including India, as a lawn grass.

This stoloniferous perennial is an excellent sand-binder and forms a good sward. It can stand shade to some extent.

4. ***Dactyloctenium henrardianum* Bor in Blumea, Suppl. 3, 44 (1946).**

Acrachne eleusinoides Wt. et Arn. in Herb. Wight., no. 3315, nomen nudum.

Dactylis interrupta Rottler in Herb. Rottl.; nomen nudum.

Distribution: Madras.

Exsicc.—Herb. Wight. 3314, Madras; Rottl. s.n., Madras.

✓ 5. ***Dactyloctenium indicum* Boiss., Diagn. sér. 2, 4, 131 (1859).**

D. glaucophyllum Courb. in Ann. Sc. Nat. sér. 4, 18, 133 (1862).

Eleusine indica (Boiss.) Duthie, Fodd. Grass. N. Ind. 58 (1888).

E. glaucophylla Munro ex Benth. in J. Linn. Soc. (Bot.) 19, 107 (1881).

Distribution: Hotter parts of the Middle East, penetrating into north-west India.

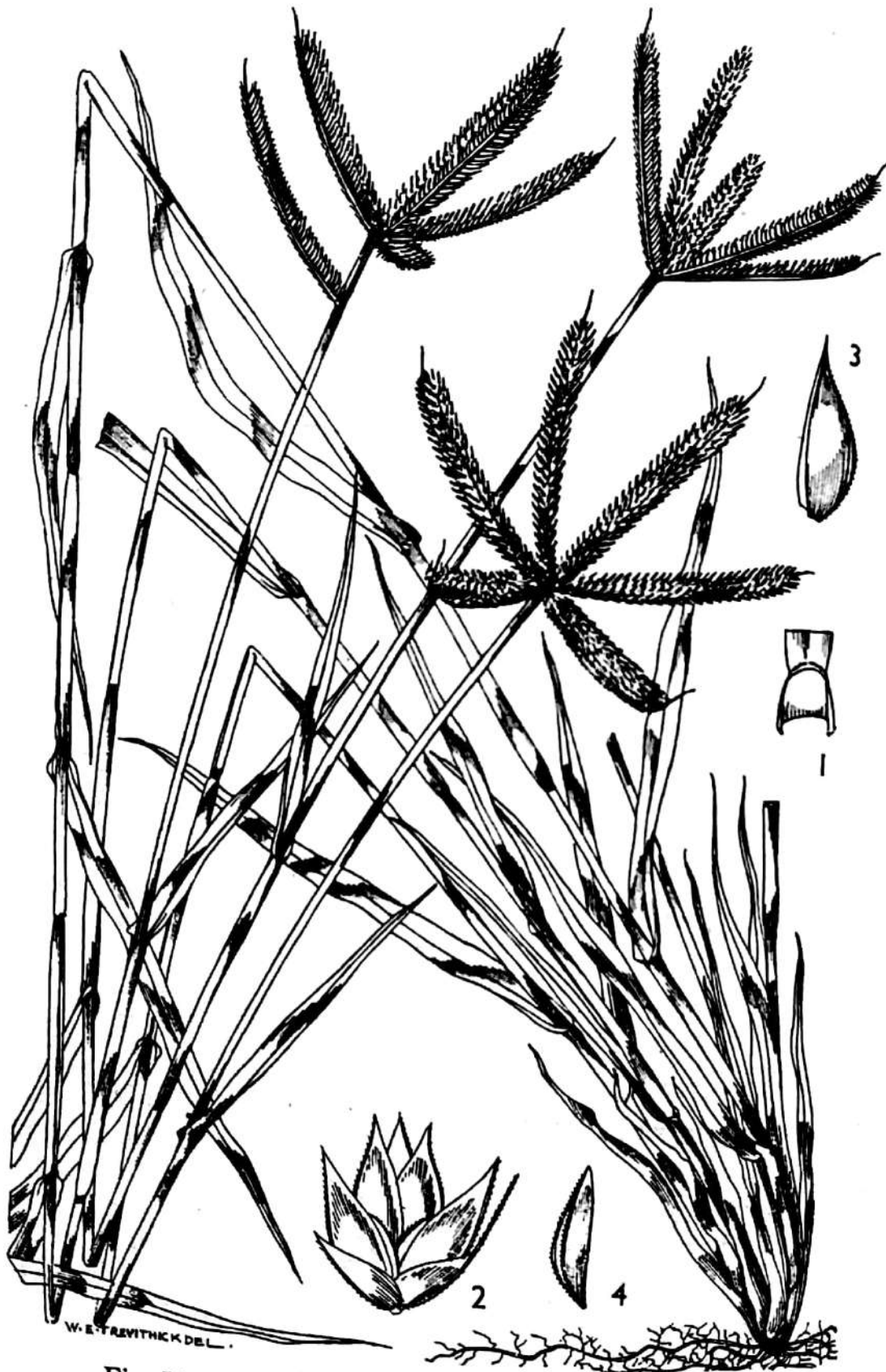


Fig. 54. *Dactyloctenium aegyptium* (Linn.) P. Beauv.
 Plant $\times 1$. 1, ligule; 2, spikelet; 3, lemma from the side; 4, palea; all $\times 6$.

A desert grass with woody stolons.
 Exsicc.—*W. T. Stearn* 11, Sind; *J. F. Duthie* 5100, Hissar.

***Desmostachya* Stapf** in *Dyer*, Fl. Cap. 7, 632 (1900).

Stapfiola O. Ktze. in Post et O. Ktze., Lexic.

Gen. Phan. 532 (1903).

✓ 1. ***Desmostachya bipinnata* (Linn.) Stapf** in *Dyer*, Fl. Cap. 7, 632 (1900).

Briza bipinnata Linn., Syst. Nat. ed. 10, 2, 875 (1759).

Uniola bipinnata Linn., Sp. Pl., ed. 2, 104 (1762).

Cynosurus durus Forssk., Fl. Aegypt.-Arab. 21 (1775).

Poa cynosuroides Retz., Obs. Bot. 4, 20 (1786).

Eragrostis cynosuroides (Retz.) P. Beauv., Ess. Agrost. 162 (1812).

Leptochloa bipinnata (Linn.) Hochst. in Flora 38, 422 (1855).

Stapfiola bipinnata (Linn.) O. Ktze. in Post et O. Ktze., Lexic. Gen. Phan. 532 (1903).

Pogonarthria bipinnata (Linn.) Chiov. in Ann. Ist. Bot. Roma, 8, 362 (1908).

Distribution: Through India, Persia, Arabia, North Africa to Tropical Africa.

A tufted plant in desert or semi-desert areas, branching from a thick scaly rootstock which sends out rhizomes in all directions, making the plant an excellent sand-binder. Opinions about the value of this species as a fodder vary, but it certainly is considered to be of great value in Afghanistan, possibly because in such an arid country fodder of any kind, no matter how unpalatable, enables stock to survive. According to Duthie it is chopped, mixed with grain and wheat, and fed to stock.

The species plays an important rôle in Hindu ceremonies and corpses are laid upon a mat woven from it, while during the shradh ceremony a ring of it is worn.

Exsicc.—*J. F. Duthie* 22908, West Himalaya; *H. H. Haines* 4387, Ranchi; *C. A. Barber* 8194, Madras; *C. B. Clarke* 20092, Bengal; *Abdul Huk* s.n., Burma.

***Dinebra* Jacq.**, Fragm. 77 (1809), t. 121, f.1.

✓ 1. ***Dinebra retroflexa* (Vahl) Panz.** in Denkschr. Acad. Wiss. München, 270 (1814), t. 12.

Cynosurus retroflexus Vahl, Symb. Bot. 2, 20 (1791).

Dinebra arabica Jacq., Fragm. 77 (1807), t. 121, f.1.

Eleusine calycina Roxb., Fl. Ind. 1, 347 (1820).

Leptochloa arabica Kunth, Rév. Gram. 1, 91 (1829).

Distribution: Western India westwards to East Africa. $2n = 20$.

Exsicc.—*J. F. Duthie* 9932, Madhya Pradesh; *C. McCann* 5050, Bombay; *Bourne* 3244, Madras.

Diplachne *P. Beauv.*, Ess. Agrost. 80 (1812), t. 16, f.9.

1. **Diplachne fusca** (Linn.) *P. Beauv.*, Ess. Agrost. 80, 163 (1812).
Festuca fusca Linn., Sp. Pl. ed. 2, 109 (1762). *Syst Veg.* -10. 876. (1759)
Festuca indica Retz., Obs. Bot. 4, 21 (1786).
Tridens indicus Nees in Wight, Cat. n. 1794 nomen nudum.
Poa contracta Retz., Obs. Bot. 3, 11 (1783).
Uralespis fusca (Linn.) Steud., Syn. Pl. Glum. 1, 247 (1854).
Triodia ambigua R.Br., Prodr. Nov. Holl. 183 (1810).
Leptochloa fusca Kunth, Rév. Gram. 1, 91 (1829).
Poa procera Roxb., Fl. Ind. 1, 334 (1820).
Eragrostis procera (Roxb.) Steud., loc. cit. 266.

Distribution: Widespread, extending from Egypt and Tropical and South Africa through South-east Asia to Australia.

Exsicc.—*U Thein Lwin* 3, Burma; *C. B. Clarke* 21605, Bengal; *J. F. Duthie* 5247, Gangetic Plain; *Thwaites* C.P. 934, Ceylon.

Eleusine *Gaertn.*, Fruct. 1, 7 (1789), t. 1.

Key to the species of *Eleusine*

1. Annuals; basal sheaths glabrous at base:—
 2. Spikes slender, narrow (c. 5 mm wide), straight, nearly glabrous at the base; seeds oblong, obtusely trigonous *E. indica*
 2. Spikes stout, broad (about 1 cm wide), incurved, hairy at the base; seeds globose *E. coracana*
1. Perennials; stem creeping and rooting at the nodes, glaucous; basal sheaths woolly at the base *E. compressa*

1. **Eleusine compressa** (Forssk.) *Aschers. et Schweinf. ex C. Christensen* in Dansk Bot. Archiv 4, no. 3, 12 (1922).

Panicum compressum Forssk., Fl. Aegypt.-Arab. 18 (1775).

Eleusine flagellifera Nees in Linnaea 16, 220 (1842).

E. arabica Hochst. ex Steud., Syn. Pl. Glum. 1, 211 (1854).

Distribution: From northwest India to North Africa.

This extremely hardy perennial is a true desert grass, existing in the most arid conditions and covering the soil or sand by means of its woody stolons rooting at the nodes.

Exsicc.—*Harsukh* 15639, Waziristan; *Griffith* 6610, Afghanistan; *D. Hooper* s.n., Sind.

2. **Eleusine coracana** (Linn.) *Gaertn.*, Fruct. 1, 8 (1789), t. 1, f.11.

Cynosurus coracanus Linn., Syst. Nat. ed. 10, 2, 875 (1759).

Originally the specific name was spelt *coracan* but Linnaeus corrected this to *coracanus* in the second edition of *Species Plantarum*, 106 (1762).
 Distribution: Widely cultivated in the tropics of the Old World. Introduced into the New. African Millet.

This grass is widely cultivated by hill tribes in India and used to make a kind of porridge or alcoholic beverage. It is not much thought of as a fodder.

Exsicc.—*W. Koelz* 3071, Kulu; *Sukoe* 9272, Burma; *J. S. Gamble* 21587, Madras.

- ✓ 3. **Eleusine indica** (Linn.) Gaertn., Fruct. 1, 8 (1789).
Cynosurus indicus Linn., Sp. Pl. ed. 1, 72 (1753).

Distribution: Tropical and subtropical regions of the earth.

The inflorescence of this species usually consists of 2–7 digitate racemes. On inhospitable sites, however, the racemes are often reduced to one, giving a very different facies to the plant. In such specimens there is, however, no appreciable difference in the structure of the spikelets. This is one of the species which are said to possess cyanogenetic glycosides in the leaves and is therefore dangerous to stock, especially when wilted. On the other hand, it is reported to be a very nutritious grass and can be used for making into hay and silage. Owing to the rapidity with which it occupies disturbed ground, it is especially useful, even though it is an annual, as a soil-binder. $2n = 18$.

Exsicc.—*U Thein Lwin* 123, Burma; *Meebold* 10439, Madras; *J. S. Gamble* 23857, Dehra; *A. H. G. Alston* 1467, Ceylon; *A. A. Bullock* 676, Manipur.

Elytrophorus *P. Beauv.*, Ess. Agrost. 67 (1812), t. 14, f.2.

- ✓ 1. **Elytrophorus spicatus** (Willd.) *A. Camus* in Lecomte, Fl. Gén. de l'Indo-Chine 7, 547 (1923).

Dactylis spicata Willd. in Ges. Naturf. Freunde Berlin, Neue Schrift 3, 416 (1801).

Sesleria spicata (Willd.) Spreng., Pugill. 2, 21 (1815).

Echinalysium articulatum and *E. strictum* Trin., Fund. Agrost. 142 (1820).

Elytrophorus articulatus *P. Beauv.*, Ess. Agrost. 67 (1812), t. 14, f.2.

Distribution: Widely distributed in the tropical regions of the Old World.

This species is frequently found in ditches and pools that have dried up. In such places it is often gregarious and very lush.

Exsicc.—*J. S. Gamble* 21730, Madras; *Thwaites* C.P. 935, Ceylon; *Po Khant* 15280, Burma; *Gammie* 18701, Kangra; *Meebold* 6881, Naga Hills.

Eragrostiella *Bor* in Indian For. 66, 269 (1940).

Eragrostis *P. Beauv.*, sect. *Plagiostachya* Benth.,
in Benth. et Hook. f.,
Gen. Pl. 3, 1186 (1883).

Key to the species of *Eragrostiella*

1. Leaves from the basal sheaths very long, narrow, rolled or folded, reaching to the base of the inflorescence:—

2. Keels of the palea broadly winged; wings hyaline, smooth *E. leioptera*
2. Keels of the palea narrowly winged; wings ciliate:—
3. Leaves flat; lemmas 2.25 mm long *E. walkeri*
3. Leaves convolute, filiform, with long white hairs; lemmas 2 mm long or slightly shorter *E. nardoides*
1. Leaves from the basal sheaths very much shorter, never reaching the base of the inflorescence, often only a few centimetres long:—
4. Keels of the palea broadly winged; leaves very narrow, almost filiform when rolled or folded:—
5. Lemmas 2.5–3 mm long, longer than broad; wings of the keels of the palea most minutely ciliate, almost smooth *E. secunda*
5. Lemmas 2.5, very rarely 2.75 mm long, as long as broad; wings of the palea-keels definitely ciliate *E. bifaria*
4. Keels of the palea not broadly winged; leaves convolute, filiform, or broader and shorter, complicate:—
6. Lemma leaden- or straw-coloured, straight on the back to the acute tip; leaves linear, obtusely apiculate, coriaceous, often complicate and falcate, usually short *E. brachyphylla*
6. Lemmas purplish in colour, curved and compressed in the last quarter to the apiculate tip, 1.75–2 mm long; leaves convolute, filiform *E. collettii*
- ✓ 1. **Eragrostiella bifaria** (Vahl) Bor in Indian For. 66, 270 (1940).
Poa bifaria Vahl, Sym. Bot. 2, 19 (1791).
P. coromandeliana Koen. ex Rottl. in Ges. Natur. Freunde Berlin, Neue Schrift 4, 191 (1803).
Eragrostis coromandeliana (Koen. ex Rottl.) Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 1, 415 (1830) per errorem *coromandelina*.
E. bifaria (Vahl) Wight ex Steud., Nom. Bot. ed. 2, 1, 562 (1840) nomen et Syn. Pl. Glum. 1, 264 (1854).
Catapodium bifarium Link, Hort. Bot. Berol. 2, 194 (1833) in obs.
C. coromandelianum Link, loc. cit. 194, in obs.
Distribution: India, Burma, Ceylon. $2n = 40$.
Exsicc.—C. A. Barber 4399, Madras; F. Ballard 1460, Ceylon; Abdul Huk s.n., Burma; Lisboa s.n., Bombay.
- ✓ 2. **Eragrostiella brachyphylla** (Stapf) Bor in Indian For. 66, 270 (1940).
Eragrostis brachyphylla Stapf apud Hook. f., Fl. Brit. Ind. 7, 327 (1896).
Distribution: Bengal, Bihar, Bombay, Madras.
Exsicc.—R. K. Bhide s.n., Bombay; J. S. Gamble 17764, Madras.
3. **Eragrostiella collettii** (Stapf) Bor in Indian For. 66, 270 (1940).
Eragrostis collettii Stapf apud Hook. f., Fl. Brit. Ind. 7, 326 (1896).
Distribution: Burma, endemic.
Exsicc.—Rhind 208, Pegu; Meebold 7777, Upper Chindwin.

4. **Eragrostiella leioptera** (Stapf) Bor in Indian For. 66, 270 (1940).
Eragrostis leioptera Stapf apud Hook. f., Fl. Brit. Ind. 7, 325 (1896).
 Distribution: Assam, Khasi Hills, Garo Hills.
 Exsicc.—Parry 1194, Garo Hills; Hook. f. s.n., Khasia.

5. **Eragrostiella nardoides** (Trin.) Bor in Indian For. 66, 270 (1940).
Eragrostis nardoides Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 1, 415 (1830).
 ? *Catapodium nepalense* Link, Hort. Bot. Berol. 2, 194 (1833).

Distribution: Himalaya, Parasnath.

Exsicc.—J. S. Gamble 27203, Tehri; C. B. Clarke 21076, Parasnath.

6. **Eragrostiella secunda** (Nees ex Steud.) Bor in Indian For. 66, 270 (1940).

Eragrostis secunda Nees ex Steud., Syn. Pl. Glum. 1, 264 (1854).

Distribution: Ceylon [lower montane zone near Bandarawalla (Pearson) and near Galagama; below Horton's Plains (Thwaites)].

Distribution: Ceylon, endemic.

Exsicc.—Kingdon-Ward 286, Ceylon; Pearson 87, Ceylon.

7. **Eragrostiella walkeri** (Stapf) Bor in Indian For. 66, 270 (1940).

Eragrostis walkeri Stapf in Trim., Fl. Ceyl. 5, 298 (1900).

Distribution: Ceylon, Madras.

Exsicc.—Walker s.n., Ceylon; Bourne 4731, Madras.

Eragrostis P. Beauv., Ess. Agrost. 70 (1812) emend. Reichb. (1828).

Eragrostis Host, Ic. Gram. Austr. 4, 14, 15 (1809) sine descr.

Megastachya P. Beauv. loc. cit. 74, 167, partim.

Key to the species and varieties of *Eragrostis*

1. Spikelets not breaking up at maturity *E. tef*
1. Spikelets breaking up at maturity, except in *E. superba*:—
 2. Spikelets breaking up from above downwards; rhachis fragile:—
 3. Lemmas ciliate on the margins:—
 4. Plants viscous *E. theinlwini*
 4. Plants not viscous; panicles spiciform:—
 5. Lemmas acuminate, mucronate or cuspidate:—
 6. Panicle clavate, dense, shining, sometimes shortly interrupted at the base; lemmas 2.5–3 mm long, very straight on the keel, shortly ciliate with firm margins; keels of the palea narrowly winged, long-ciliate *E. spicata* deccanensis
 6. Panicle cylindric, compact; spikelets rather dull, matt; lemmas 2–2.5 mm long, long-ciliate on the margins, rather soft; keels of palea long ciliate, not winged *E. ciliata*
 5. Lemmas obtuse, 1–2 mm long; cilia on the margins often reduced to a few at the base; keels of palea short- to long-ciliate *E. coarctata*
 3. Lemmas not ciliate on the margins:—

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7. Keels of the palea more or less ciliate:—
 8. Panicles spiciform, or compact and dense:—
 9. Annuals; lemmas ciliate (at least the upper) on the keels; lateral nerves close to the margins of the lemma; cilia on keels of palea soft, longer than the width of the palea
E. ciliaris
 10. Panicle spiciform, more or less lobed or interrupted
E. ciliaris var. *brachystachya*
 10. Panicle short, thick, compact
E. ciliaris var. *brachystachya*
 9. Perennials; lemmas not ciliate on the keels:—
 11. Lemmas 1.25 mm long, rounded at the apex; panicle very dense, cylindric
E. riparia
 11. Lemmas 1.75 mm long, acute at the apex in profile; panicle more or less dense; margins of the lemmas with a few cilia below
E. coarctata
 8. Panicles effuse:—
 12. Lemmas ciliate on the keel
E. ciliaris var. *clarkei*
 12. Lemmas not ciliate on the keels:—
 13. Culms and leaves more or less viscous
E. viscosa
 13. Culms and leaves not viscous
E. tenella
 14. Panicle loose with spreading branches; axis more or less hairy at the nodes
E. tenella var. *tenella*
 14. Panicle contracted with ascending branches; axis glabrous
E. tenella var. *insularis*
7. Keels of the palea scabrid or smooth, not ciliate:—
 15. Panicles thyriform or very broadly oblong with numerous capillary branches bearing long- or short-pedicelled spikelets:—
 - 15a. Panicles thyriform, 25–60 cm long, 35 cm wide; lemmas 1.5 mm long, markedly truncate
E. aspera
 - 15a. Panicle broadly ovate or elliptic, about half the length of the plant; lemmas 2.5–3 mm long; glumes acuminate, as long as lowest lemma
E. trichodes
 15. Panicle oblong or linear, not thyriform, not more than 15 cm wide:—
 16. Stem tall, stout, branched; panicle very long, made up of branches which are solitary or 2–3 in a whorl; branches elongate, 5–12 cm long, usually simple, often bare at the base, bearing small spikelets
E. diplachnoides
 16. Stem slender; branches not more than 5 cm long:—
 17. Branches of the panicle more or less whorled; spikelets loose, scattered, few-flowered; lemma less than 1 mm long
E. japonica
 17. Branches of the panicle mostly solitary; spikelets densely clustered, 6–14-flowered; lemma about 1 mm long
E. diarrhena

2. Spikelets breaking up from below upwards; rhachis tough; lemmas falling away with or without the paleas; lemmas, paleas and glumes falling very tardily in *E. tef*:—
18. Annuals:—
19. Lemmas up to 1.5 mm long:—
20. Plants glandular; the glands may be raised glands on the keel of the lemma or on the margins of the leaves or sheaths, or are sunk or band-like on the pedicel or band-like patches on the culms below the nodes:—
21. Lowest branches of the panicle fascicled or subwhorled, with pitted glands just above and below the lowest node; glandular band below culm nodes *E. pilosa*
21. Lowest branches not whorled:—
22. Pedicels of the spikelets with a pitted gland with raised margins or at any rate a sunken glandular patch; mouth of sheath bearded; a broad glandular patch on the axis below the panicle-branches, with or without a row of pits on its lower margin:—
23. Spikelets 1.5–1.75 mm broad; leaf-sheaths bearded or naked at the mouth; leaf-margins eglandular; lower glume 0.5–0.75 mm long; upper 1 mm long; lemmas broadly elliptic, acute, 1.25–1.5 mm long; grain truncate at both ends, dorsally grooved; palea persistent *E. maderaspatana*
23. Spikelets 2–2.5 mm wide; leaf-sheaths bearded in the throat; leaf-margins most often with raised glands on the margins; glumes subequal, 1–1.25 mm long; lemmas broadly ovate-obtuse, olive-green, 1.5–1.75 mm long; grain globose or ellipsoid-globose; paleas persistent *E. poaeoides*
22. Pedicels of the spikelets without a pitted gland but they and branches with glandular spots; spikelets 1.25–1.5 mm wide; glumes subequal, about 1 mm long; lemmas pale brown or white, 1.25–1.5 mm long, oblong, subacute *E. rottleri*
20. Plants eglandular:—
24. Spikelets more or less fascicled on the primary or secondary branches, all pointing forwards, or shortly pedicelled in narrow racemes:—
25. Tips of the lemmas acute or obtuse; culms 20–40 cm tall:—
26. Lemmas closely imbricate with broad overlapping margins, about 1 mm long and as broad; lateral nerves inconspicuous; spikelets flat, often rose-coloured; panicles rather open; grain 0.5 mm long; paleas persistent *E. malayana*

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26. Lemmas not closely imbricate with overlapping margins, 1-1.25 mm long, not particularly broad; side nerves conspicuous; spikelets not flattened; spikelets slate-grey in a rather crowded panicle; grain 0.6 mm long; paleas deciduous *E. gangetica*
25. Tips of the lemmas very acute, seen from the side almost acuminate; dwarf plants not above 12 cm tall; lemma 1.25-1.5 mm long; paleas deciduous *E. multicaulis*
24. Spikelets not fascicled, seated on long pedicels in ample panicles with filiform branches which are fascicled or sub-whorled at the lowest node:—
- 26a. Spikelets 0.75-1 mm wide; long white hairs usually in the axils of the panicle branches; lower glume 0.3-0.5 mm long, upper 1 mm long; panicle greyish or olive-green; lemmas often with a purple spot at the tip *E. pilosa*
- 26a. Spikelets 1.25-1.5 mm wide; no long hairs in the axils of the panicle branches; lower glume 1.2-1.5 mm long, upper glume 1.5-1.6 mm long; whole panicle drooping, dark leaden-grey *E. macilenta*
19. Lemmas over 1.5 mm long:—
27. Plants with glands; glands conical or pitted on pedicels and margins of leaves or as large patches on the culm below the panicle:—
28. Panicles of few spikelets on long pedicels which are covered with wart-like glands; spikelets 3.5-4 mm wide, ovate-oblong or oblong; lemmas very broadly ovate-obtuse, 2.5 mm long, pale *E. barbulata*
28. Panicles, pedicels and spikelets not as above, often leaden or dark-coloured:—
29. Pedicels without a crateriform gland:—
30. Spikelets 2-4 mm wide, crowded or loose, pale, often slate- or leaden-grey in colour; lemmas lanceolate or ovate-oblong-obtuse, 2-2.2 mm long, not diminishing in length upwards; leaves almost always with raised glands on the keel and margins; sheaths often with irregularly distributed pitted glands; grain globose, 0.5 mm in diameter *E. cilianensis*
30. Spikelets 1.5 mm wide in a very ample panicle, olive- to leaden-grey; lower glume 1.5 mm, upper glume 2-2.5 mm long; lemmas lanceolate-acute in shape, lowest 2.5-2.8 mm long, rest diminishing in length upwards; leaves and lemmas eglandular; anthers 0.2-0.3 mm long; grain 1-1.5 mm, ovate-oblong *E. tef*

29. Pedicels with a crateriform gland; grain oblong, light brown in colour; spikelets 1.3–2 mm wide; lemmas 1.5–2 mm long
E. poaeoides
27. Plants devoid of glands:—
- 30a. Spikelets 2 mm or more wide, ovate or ovate-oblong:—
31. Paleas deciduous; spikelets ovate to ovate-oblong, green to reddish-purple in colour; lemmas ovate or ovate-elliptic in shape, 2 mm long; lateral nerves at an angle of 60° or more to the axis; sheaths not bearded at the mouth; grain obovoid or ellipsoid, compressed
E. unioides
31. Paleas persistent; spikelets narrowly oblong or ovate-oblong, leaden-grey in colour; lemmas ovate to ovate-oblong, 2–2.2 mm long; lateral nerves at most at 40° to the axis; sheaths bearded at the mouth; normally glandular on keels of lemmas and on the leaf-margins; grains subglobose
E. cilianensis
- 30a. Spikelets 0.75–2 mm wide:—
32. Spikelets 1.5 to just under 2 mm wide:—
33. Plants without panicles emerging from the basal sheaths:—
34. Spikelets many-flowered (10–70), pale green or purplish, often curved:—
35. Spikelets seated on pedicels over 5 mm long; lemmas broadly ovate-acute
E. tremula
35. Spikelets seated on pedicels not more than 2 mm long; lemmas narrower, elliptic- or lanceolate-acute
E. pappiana
34. Spikelets not more than 12-flowered, leaden-grey or blackish, not curved; panicle drooping
E. macilenta
33. Plants with panicles just emerging from the basal sheaths; lemmas 2.5 mm long; anthers 0.25 mm long
E. barrelieri
32. Spikelets much narrower; spikelets straight not curved; branches fascicled or subwhorled at lowest node; lemmas acute, leaden-grey in colour with a purple patch towards the tip; glumes very unequal; lower 0.3–0.5 mm long; upper 1–1.3 mm long
E. pilosa
18. Perennials:—
36. Lemmas up to 1.8 mm long:—
37. Spikelets 1.75–2.5 mm wide; paleas deciduous with the lemmas:—
38. Inflorescence a widely spreading panicle of long-pedicelled spikelets up to 5–6 mm long, 1.5 mm wide; pedicels 10–20 mm long; lemmas 1.5–1.75 mm long, 1 mm wide,

- elliptic-acute; grain ellipsoidal, 0.5–0.75 mm long, circular in cross section; anthers 0.4 mm long *E. burmanica*
38. Inflorescence a more or less contracted panicle of shortly pedicelled spikelets; spikelets 5–9 mm long, 2–2.5 mm wide; pedicels 1–3 mm long; panicle up to 20 cm long by 8–9 cm wide; lemmas 1.5–1.8 mm long, 1.5 mm wide, elliptic-oblong-acute; lateral nerves strong; grain oblong, 0.6 mm long *E. atrovirens*
37. Spikelets 1–1.25 mm wide; paleas persistent:—
39. Lemmas 1–1.25 mm long:—
40. Panicle contracted, up to 12 cm long, not more than 3 cm wide; spikelets crowded, packed, straight, 1 mm wide; lemmas 1.25 mm long, 1 mm broad, oblong-acute; lateral nerves straight; tip of lemma overlapping base of lemma next above; grain ellipsoidal-globose, 0.5 mm long, circular in section *E. nutans*
40. Panicle widely spreading; spikelets loose, slightly curved, 1–1.25 mm wide; lemmas 1 mm long, 1.5 mm wide, almost orbicular in shape, leaden-grey in colour; lateral nerves curved; tip of lemma just touching base of lemma next above or overlapping slightly; grain cuneate-truncate, grooved on the back, 0.5 mm long, triangular in cross-section *E. papposa*
39. Lemmas 1.5–1.8 mm long:—
41. Culms usually repeatedly geniculately branched; leaves usually pungent, convolute, not as a rule curved *E. lehmanniana*
42. Culms glabrous *var. lehmanniana*
42. Culms hairy *var. chaunantha*
41. Culms not conspicuously geniculate below; leaves filiform, convolute, curved, usually rather short *E. chloromelas*
36. Lemmas 2 mm long and over:—
43. Pedicels of the spikelets with a glandular band:—
44. Glumes minute, less than 1 mm long; panicle up to 15 cm long, 6 cm broad; branches up to 4 cm long; lemmas dark olive-green to slaty-black, 2 mm long, 1.5 mm broad, strongly compressed from base to apex, abruptly acute or apiculate, almost mucronate; lateral nerves obscure *E. tenuifolia*
44. Glumes at least 2 mm long; panicle large, up to 25 cm long, 8 cm broad; branches up to 8 cm long; lemmas rounded on the back, firmly compressed at the tip, olive-green tinged with purple, 2.5–3 mm long, 1.5 mm broad, oblong-obtuse or subacute; lateral nerves conspicuous, long *E. ferruginea*

43. Pedicels of the spikelets devoid of a glandular band:—
45. Spikelets more or less fascicled in groups on the primary or secondary branches; pedicels very short, not more than 2 mm long:—
46. Spikelets up to 2 mm wide, sometimes up to 2.5 cm long; lemmas 2–2.5 mm long, 2 mm wide, ovate-acute in shape, acuminate in profile; basal leaves flat *E. zeylanica*
46. Spikelets up to 2 mm wide, at the most 1.5 cm long; lemmas 2 mm long, 1.8 mm wide, broadly elliptic-acute, not acuminate in profile, rather firmer and scabrid on the dorsal surface; basal leaves filiform *E. cumingii*
45. Spikelets panicle; panicle dense and narrow or effuse:—
47. Panicle narrow, linear to oblong, nodding, 15–30 cm. long; pedicels not more than 3 mm long; lower glume minute, 0.5 mm long or less; upper 1 mm long; lemmas 2–2.5 mm long, somewhat spreading, olive-green to olive-grey, concave on keel; nerves dotted with tiny pit-like glands *E. plana*
47. Panicles effuse; glumes not very unequal; lemmas straight on the back; nerves of lemma without tiny glandular pits:—
48. Leaves filiform, curved at the tips; spikelets usually dark olive-grey:—
49. Very robust, coarse grass with long tightly clasping basal sheaths, usually rosy or reddish-purple in colour *E. robusta*
49. Not robust or coarse, lower sheaths short, not tightly clasping, usually green or straw-coloured:—
50. Plants with short, dense basal tufts of filiform curling leaves; inflorescence open and lax; branches filiform, flexible, purplish; spikelets spreading, not appressed to the branches *E. chloromelas*
50. Plants with flat or filiform leaves, but where filiform usually longer and often drooping; inflorescence extremely variable, dense or lax and divaricate; branches not filiform, usually rather rigid *E. curvula*
48. Leaves not long or filiform with curved tips:—
51. Spikelets slaty-grey to black, at most 2 mm wide; lemmas 1.5 mm long *E. nigra*
51. Spikelets yellowish or reddish, 6–9 mm wide, falling entire; lemmas 4 mm long *E. superba*

- ✓ 1. *Eragrostis aspera* (Jacq.) Nees, Fl. Afr. Austr. 408 (1841).
Poa aspera Jacq., Hort. Vindob. 3, 32 (1776), t. 56.
P. paniculata Roxb., Fl. Ind. 1, 341 (1820).



Fig. 55. *Eragrostis aspera* (Jacq.) Nees
 Plant $\times \frac{1}{2}$. 1, ligule; 2, spikelet $\times 8$; 3, portion of spikelet showing axis $\times 8$;
 4, lower glume; 5, upper glume; 6, lemma; 7, palea $\times 12$; 8, grain $\times 16$.



Fig. 56. *Eragrostis barbulata* Stapf
 1, base and portion of stem; 2, inflorescence $\times \frac{1}{2}$; 3, node showing ring of glands at top of internode $\times 3$; 4, spikelet and glandular pedicel $\times 5$; 5, lemma from the side; 6, palea from the side; 7, palea, ventral surface; 8, grain and embryo; all $\times 8$.

Exsicc.—*Meebold* 8117, Burma; *N. L. Bor* s.n., Sylhet, Assam; *S. Kura* s.n., Nicobars; *Thwaites* C.P. 3047, Ceylon.

***Halopyrum* Stapf** in Hook., Ic. Pl. (1896), t. 2448.

1. ***Halopyrum mucronatum* (Linn.) Stapf** in Hook. Ic. Pl. (1896), t. 2448.

Uniola mucronata Linn., Sp. Pl. ed. 2, 104 (1762).

Triticum repens Thw., Enum. Pl. Zeyl. 376 (1864) non Linn. (1753).

Desmazeria unioloides Deff., Voy. Yemen 220 (1889).

Brizopyrum mucronatum Nees in Wall. Cat. Herb. Ind. (1849) n. 8898 nomen.

Distribution: North-east Africa, Southern Arabia, Sind, Bombay, Madras and Ceylon.

A coastal species with remarkably thick roots, woolly with root-hairs. Grows in huge tufts, and while it is not considered to be of much value for fodder, is an excellent sand-binder. In Somaliland it grows on the sand dunes at the limit of high tides and acts as a buffer between the sea and dunes.

Exsicc.—*Thwaites* C.P. 924, Ceylon; *Bourne* s.n., Madras; *Stocks* s.n., Sind.

***Leptochloa* P. Beauv.**, Ess. Agrost. 71 (1812), t. 15, f.1.

Key to the species of *Leptochloa*

1. Leaves flat, lanceolate, oblong or elliptic in shape, membranous, 2.5–10 cm long; spikelets 1-flowered *L. uniflora*

1. Leaves narrowly linear, flat or involute; spikelets 1–7-flowered:—

2. Spikelets 1-flowered

L. neesii

2. Spikelets 2–7-flowered:—

3. Glumes lanceolate, acuminate, caudate or mucronate; lemmas pubescent or hairy:—

4. Florets 2, rarely 3; glumes unequal, lower 0.8–1 mm long, upper 1.2–1.4 mm long; racemes very slender, 2.5–6 cm long

L. panicea

4. Florets usually 3–6, but 2 or even 7; glumes unequal; the lower 1.2–2 mm long, the upper 1.5–2.5 mm long; racemes thick, 5–10 cm long

L. chinensis

3. Glumes ovate, rounded or retuse at the apex; lemmas glabrous, ciliolate on the keel

L. obtusiflora

✓ 1. ***Leptochloa chinensis* (Linn.) Nees** in Syll. Ratisb. 1, 4 (1824).

Poa chinensis Linn. Sp. Pl. ed. 1, 69 (1753).

P. malabarica Retz., Obs. Bot. 5, 19 (1789) non Linn. (1753).

Distribution: South-east Asia.

Exsicc.—C. B. Clarke 4096, Bengal; Naganathan 19412, Madras; Thwaites C.P. 3748, Ceylon; Helfer s.n., Burma.

2. **Leptochloa neesii** (Thw.) Benth. in J. Linn. Soc. (Bot.) **19**, 108 (1881).
Cynodon neesii Thw., Enum. Ceyl. Pl. 371 (1864).

Distribution: Madras State, Ceylon, Australia, Malaya.

A rather robust weed.

Exsicc.—Meebold 13806, Madras; Thwaites C.P. 3749, Ceylon.

3. **Leptochloa obtusiflora** Hochst. in Flora **38**, 203 (1855).
Eleusine obtusiflora (Hochst.) Blatt. in Rec. Bot. Surv. India **8** (Fl. Arab. pt. 5), 505 (1936).

Distribution: South India, Arabia, East Africa.

A rather coarse weed.

Exsicc.—C. A. Barber 4442, Madras; Rottler s.n., Madras (type).

- ✓ 4. **Leptochloa panicea** (Retz.) Ohwi in Bot. Mag. Tokyo **55**, 311 (1941).
Poa panicea Retz., Obs. Bot. **3**, 11 (1783).
Leptochloa filiformis of the Fl. Brit. Ind. **7**, 298 (1896) non P. Beauv.
Aira filiformis Koen. ex Roxb., Fl. Ind. **1**, 328 (1820).

Distribution: Tropical Asia and Africa.

A slender weed in waste places. The *Leptochloa contracta* (Retz.) Blatt. et McCann, *Bombay Grasses* 243 (1935) is based on *Poa contracta* Retz., Obs. Bot. **3**, 11 (1783) which is *Diplachne fusca* (Linn.) P. Beauv. || why this remarks here?

Exsicc.—R. R. Stewart 23312, Punjab; Griffith 6620, Bengal; G. King 17, Madhya Pradesh; Thwaites C.P. 3245, Ceylon.

5. **Leptochloa uniflora** Hochst. ex A. Rich., Tent. Fl. Abyss. **2**, 409 (1851).

Cynodon gracilis Nees ex Steud., Syn. Pl. Glum. **1**, 213 (1854).

Leptochloa gracilis Wight ex Steud., loc. cit. 213, nomen.

Agrostis montana Rottl. ex Hook. f., Fl. Brit. Ind. **7**, 298 (1896).

Craspedorhachis uniflora (Hochst. ex A. Rich.) L. Chippendall in Meredith, Grass. and Past. South Africa, 205 (1955).

Distribution: South India, Ceylon and Tropical Africa.

This species produces a quantity of tender leaf and is probably acceptable to grazing animals.

Distribution: South India, Ceylon, Tropical Africa.

Exsicc.—Bourne 1980, Madras; Thwaites C.P. 2948, Ceylon.

Myriostachya Hook. f., Fl. Brit. Ind. **7**, 327 (1896).

Key to the varieties of *Myriostachya wightiana*

1. Spikelets 2–6-flowered
1. Spikelets 8–20-flowered

var. *wightiana*
var. *longispicula*

1. **Myriostachya wightiana** (Nees ex Steud.) Hook. f., Fl. Brit. Ind. 7, 327 (1896).

Eragrostis wightiana Benth. in Hook., Ic. Pl. (1882), t. 1381.

Leptochloa wightiana Nees ex Steud., Syn. Pl. Glum. 1, 209 (1854).

Dinebra verticillata Wight ex Steud. loc. cit. 209, nomen.

Distribution: Ceylon, South India, coast of Bengal, extending to Tenasserim and down into Malaya, Siam and Indo-China.

var. **wightiana**.

Exsicc.—Nusker 1238, Bengal; Helfer s.n., Tenasserim; Heinig s.n., Sundribans; U Thein Lwin 5, Burma.

var. **longispicula** Hook. f., loc. cit. 328.

Myriostachya longispicula (Hook. f.) Senaratna, Grasses of Ceylon, 66 (1956).

Exsicc.—Trimen s.n., Ceylon.

Apart from the length of the spikelet, the more numerous florets and a slightly smaller lemma, I can find no difference between these two varieties.

This species is found growing in the mud of tidal rivers just at high-water mark. The spikelets are sometimes diseased and show a yellow, enlarged and distorted ovary.

Neyraudia Hook. f., Fl. Brit. Ind. 7, 305 (1896).

Key to the species of *Neyraudia*

- | | |
|---|-----------------------|
| 1. Lowest lemma in the spikelet fertile | <i>N. arundinacea</i> |
| 1. Lowest lemma empty | <i>N. reynaudiana</i> |

1. **Neyraudia arundinacea** (Linn.) Henr. in Meded. Herb. Leid. no. 58, 8 (1929) in obs.

Aristida arundinacea Linn., Mant. Pl. Alt. 186 (1771).

Arundo madagascariensis Kunth, Rév. Gram. 1, 273 (1830), t. 48.

The type of this plant, *Aristida arundinacea* Linn., has been examined and there is no doubt that Henrard's combination is the correct name for this grass. Linnaeus states in the *Mantissa Altera* that he got the plant from Koenig who evidently collected it in India.

Distribution: Tropical Africa, the Mascarenes and north-western India. Exsicc.—J. S. Gamble 22395, Dehra Dun; J. R. Drummond 21079, Punjab.

2. **Neyraudia reynaudiana** (Kunth) Keng ex Hitchc. in Amer. J. Bot. 21, 131 (1934).

Arundo reynaudiana Kunth, Rév. Gram. 1, 275 (1830), t. 49.

A. zollingeri Buese in Miq., Pl. Jungh. 343 (1854).

Phragmites zollingeri Steud. in Zoll., Verz. 55 (1854).

Neyraudia madagascariensis var. *zollingeri* Hook. f., Fl. Brit. Ind. 7, 305 (1896).

Distribution: Eastern India, Burma, Malaya, China, Japan.
 Exsicc.—*J. S. Gamble* 7840, Sikkim; *N. E. Parry* 858, Garo Hills, Assam;
C. E. Parkinson 13910, Burma.

Orinus Hitchc. in *J. Acad. Sci. Wash.* **23**,
 136 (1933), f.2.

1. ***Orinus thoroldii* (Stapf) Bor** in *Kew Bull.* **1951**, 454 (1952).
Diplachne thoroldii Stapf ex Hemsl. in *J. Linn. Soc. (Bot.)* **30**, 121
 (1894).
Orinus arenicola Hitchc. in *J. Wash. Acad. Sci.* **23**, 136 (1933).

Distribution: Tibet, Ladak and Kashmir at high altitudes in dry, sandy habitats (c. 4000 m).

This grass may eventually prove to be of some importance as a sand-binder and stabilizer of shifting sands. The underground network of roots arises from the numerous widely spreading scaly rhizomes which radiate in all directions from the base of the plant.

When the tip of the rhizome reaches the surface, buds are produced in the axils of the scales and these develop into the flowering shoots, and at the same time more radiating rhizomes penetrate the sand in all directions.

As everything green is welcome to grazing animals at these high altitudes, it is possible that the species has some fodder value.

Exsicc.—*W. Koelz* 2365, Ladak, Kashmir; *Younghusband* 147, Tibet.

***Tripogon* Roem. et Schult.**, *Syst. Veg.* **2**, 34 (1817).

***Plagiolytrum* Nees** in *Proc. Linn. Soc.* **1**, 95 (1841).

Key to the species of *Tripogon*

1. Lowest lemma different from all the others; it is empty and has only one awn. *T. wardii*
1. Lowest lemma similar to all the others in sex and shape:—
 2. Culms thickened below by the persistent leaf-sheaths; leaves equitant, rigid, pungent; spikes 4–6 cm long *T. pungens*
 2. Culms not as above:—
 3. Lemmas cleft at the apex into 2 lobes, awned in the cleft; lobes awned or not:—
 4. Median awn as long as or longer than the lemma:—
 5. Awn flexuous, capillary, several times as long as the lemma *T. capillatus*
 5. Awn straight or curved, not more than twice as long as the lemma:—
 6. Spikelets 1–4 cm long; paleas broadly winged *T. wightii*
 6. Spikelets not more than 1.5 cm long; paleas not broadly winged:—

7. Lower glume \pm symmetrical; median awn usually less than twice as long as the lemma, geniculate, strongly twisted below; ligule membranous, ovate; no cilia in the throat of the sheath; a dwarf grass usually not more than 10 cm tall, often much less, occasionally up to 18 cm tall; leaves 2.5 cm long
T. pauperculus
7. Lower glume lobed on one side; median awn about twice as long as the lemma, not geniculate or twisted; ligule very short, ciliate; densely ciliate in the throat; a grass reaching 45 cm in height; leaves 15–25 cm long
T. trifidus
4. Median awn shorter than the lemma, occasionally almost absent:—
8. Perennials with wiry roots forming tufts; leaves glabrous:—
9. Leaves and culm glaucous; leaves 5–20 cm long, involute, filiform; ligule very short but definite, ciliate
T. jacquemontii
9. Leaves and culm green, not glaucous; leaves 30–60 cm long, 4–8 mm wide, usually flat, sometimes rolled; ligule obsolete
T. lisboae
8. Perennials, with fibrous roots, forming a close turf; leaves covered with a mass of matted white hairs:—
10. Spikelets 2–3-flowered; culms up to 10 cm tall; lemmas up to 3 mm long:—
11. Whole plant with a purple tinge; spikelets 2- rarely 3-flowered; anthers 1.5 mm long; upper glume 3–3.5 mm long, acuminate; lemma 2.5–3 cm long; found in the Himalaya, 1–5000 m; spikes not very stout
T. purpurascens
11. Whole plant green; spikelets 1–2-flowered; anthers 0.5–1 mm long; lower glume minute, 0.75 mm long; upper glume about as long as the spikelet, obtuse, 3 mm long; lemma 2.5 mm long; found in the Deccan, 600–1000 m, in rocky places; spikes stout, very like *Lepturus*
T. roxburghianus
10. Spikelets 4–5-flowered:—
12. Culms up to 45 cm tall; lower glume 3.5 mm, upper glume 4–4.5 mm long; lemmas 3.5–4.5 mm long; anthers 1.25–1.75(2) mm long
T. hookerianus
12. Culms up to 10 cm tall; upper glume 2.25 mm long; lemma 2.25 mm long
T. roxburghianus
3. Lemmas cleft at the apex into 4 lobes or with a definite lobe between each lateral awn and the median; outer lobes, if present, awned or not; inner membranous, sometimes very short, truncate:—

13. Median awn shorter than or nearly equal to the lemma; stout grass; upper glume 2-fid *T. bromoides*
 13. Median awn twice as long as the lemma or more; very slender grass; upper glume 2-toothed below the apex *T. filiformis*

- ✓ 1. ***Tripogon bromoides* Roem. et Schult.**, Syst. Veg. 2, 600 (1817).
Triathera bromoides Roth ex Roem. et Schult., loc. cit. 600.
Tripogon festucoides Jaub. et Spach, Ill. Fl. Orient. 4, 49 (1851), t. 333.
T. lanatus Hochst. ex Steud., Syn. Pl. Glum. 1, 301 (1854).
T. zeylanicus Thw., Enum. Pl. Zeyl. 374 (1864).
Plagiolytrum calycinum Nees in Proc. Linn. Soc. 1, 95 (1841).
Avena mysorensis Spreng., Syst. Veg. 1, 337 (1825).
 Distribution: South India and Western Ghats.

This species is found frequently on old walls.

Exsicc.—*Bourne* 5223, Madras; *Thwaites* C.P. 281, Ceylon.

This is an extremely variable grass, as are most of the related species, and varieties like var. *major* Stapf and var. *longifolius* Hook. f. are hardly worth keeping up. The usual habitat of the species of the genus is exacting, but specimens will grow on more fertile soils and respond accordingly.

- ✓ 2. ***Tripogon capillatus* Jaub. et Spach**, Ill. Fl. Or. 4, 47 (1851), t. 332.
 Distribution: Western Ghats and Parasnath.

This species is frequently found growing in the moss on old trees or on old walls. The specimens found on Parasnath differ from those from the Western Ghats in the size of the upper glume. In the Parasnath specimens, the upper glume is, at the most, shortly awned, and awn and glume together are shorter than the spikelet. In the Western Ghats specimens the awn is often as long as or longer than its glume, and the two together are longer than the spikelet. Perhaps the former is a good species.
 Exsicc.—*Jacquemont* 580, Poona; *McCann* A61, Khandala; *C. B. Clarke* 20777, Parasnath; *E. Barnes* 858, Coorg.

- ✓ 3. ***Tripogon filiformis* Nees ex Steud.**, Syn. Pl. Glum. 1, 301 (1854).
T. semitruncatus Nees ex Steud., loc. cit. 301.
T. unidentatus Nees ex Steud., loc. cit. 301.
Plagiolytrum filiforme Nees in Proc. Linn. Soc. 1, 95 (1841).
P. unidentatum Nees in loc. cit. 95.
Catapodium filiforme Nees ex Duthie, Grass N.W. Ind. 33 (1883).

✓ var. ***filiformis***.

Distribution: North and north-east India.

Exsicc.—*J. S. Gamble* 5158, Simla; *J. F. Duthie* 297, Jumna Valley; *N. L. Bor* 16660, Lahul; *G. A. Gammie* 1095, Sikkim.

var. ***tenuispica* Hook. f.**, Fl. Brit. Ind. 7, 288 (1896).

Distribution: Sikkim and Khasia (more slender but it is hardly worth varietal rank).

Exsicc.—*Wallich* 8892, Sylhet; *Griffith* 6635, Assam.

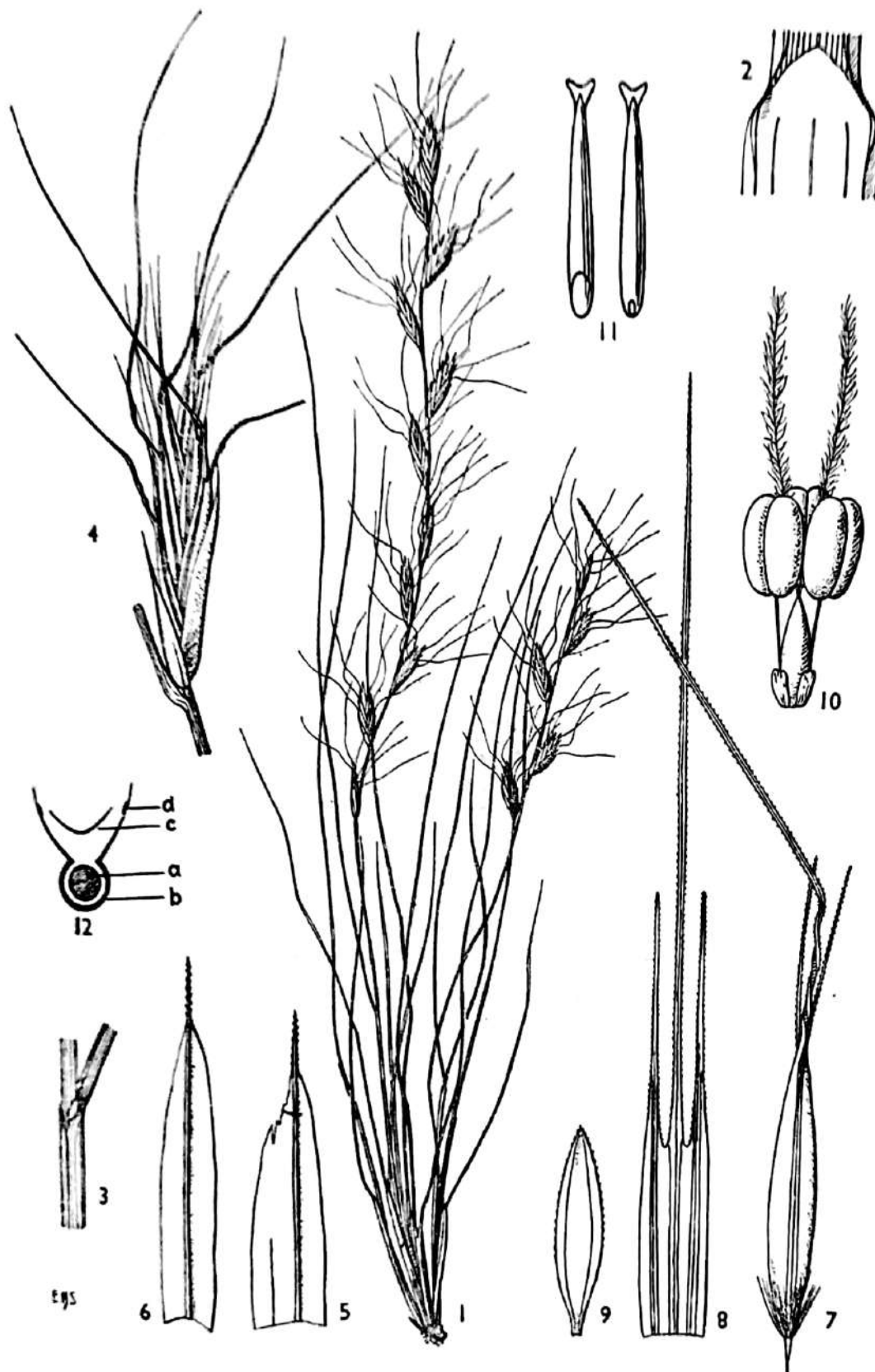


Fig. 57. *Indopoa paupercula* (Stapf) Bor
Tripogon pauperculus Stapf

1, plant $\times 1$; 2, ligule $\times 10$; 4, spikelet $\times 4$; 5, lower glume $\times 10$; 6, upper glume $\times 10$; 7, a floret $\times 6$; 8, lemma $\times 6$; 9, palea $\times 8$; 10, stamens ovary and lodicules $\times 10$; 11, caryopsis, showing embryo and hilum $\times 10$; 12, cross section of a mature floret: a, seed; b, lemma; c, palea; d, lateral nerves of lemma (enlarged).

POOIDEAE—FESTUCEAE

FESTUCEAE Dumort., Obs. Gram. Belg. 82, 85 (1823)

Spikelets all alike, hermaphrodite, rarely dioecious, or dissimilar and then the latter consisting of empty glumes and lemmas, more or less laterally compressed, 2- to many-flowered, with the uppermost floret or florets reduced; rachilla disarticulating above the upper glume and between the florets, rarely below the glumes and then the spikelets falling entire. Glumes usually persistent, awned or awnless, the lower more or less equal to the upper or shorter, rarely absent altogether, rarely both minute, the lower 1-, the upper 3-nerved. Lemmas herbaceous, becoming firmer, 5-13-nerved, awned or awnless; awn straight or curved; paleas 2-keeled. Lodicules 2, rarely 0. Stamens 3, rarely 1. Grain usually tightly enclosed by the lemma and palea; hilum punctiform and basal, or linear and then as long as the grain; starch-grains compound.

Annual or perennial grasses. Leaf-blades setaceous, filiform or linear, with festucoid anatomy; silica-cells oblong or circular; 2-celled microhairs absent; ligule membranous. Spikelets pedicelled in loose or contracted panicles, rarely in racemes or sessile in panicle or solitary spikes.

Chromosomes large; basic number 7 (mostly) or 5.

<i>Genera:</i>	<i>Beckmannia</i>	<i>Lamarckia</i>
	<i>Briza</i>	<i>Leucopoa</i>
	<i>Castellia</i>	<i>Lolium</i>
	<i>Catabrosa</i>	<i>Nardus</i> <i>rus adfenda</i>
	<i>Colpodium</i>	<i>Poa</i>
	<i>Cynosurus</i>	<i>Psilurus</i>
	<i>Dactylis</i>	<i>Puccinellia</i>
	<i>Eremopoa</i>	<i>Sclerochloa</i>
	<i>Festuca</i>	<i>Vulpia</i>
	<i>Fingerhuthia</i>	

Key to the genera of Festuceae

1. Plants dioecious **Leucopoa**
1. Plants hermaphrodite:—
 2. Spikelets of two kinds, fertile and sterile, the latter surrounding the former, or collected at the base of a dense panicle:—
 3. Sterile spikelets at the base of a Phleum-like dense panicle; glumes awned **Fingerhuthia**
 3. Sterile spikelets surrounding the fertile:—
 4. Fertile spikelet 2-3-flowered; sterile spikelets consisting of numerous awned scales **Cynosurus**
 4. Fertile spikelet 1-flowered; sterile spikelets consisting of obtuse glumes **Lamarckia**

2. Spikelets all of one kind:—
 5. Spikelets disarticulating above the glumes, not subcircular in outline, more than 1-flowered:—
 6. Inflorescence a spike or occasionally the spikes paniced:—
 7. Upper and lower glume present:—
 8. Lemmas tuberculate on the dorsal surface, 4 mm long, not awned; spikes not 1-sided, simple or paniced
Castellia
 8. Lemmas not tuberculate on the dorsal surface, up to 3 mm long excluding the awn, long- or short-awned; spikes 1-sided, always simple
Nardurus
 7. Lower glume absent:—
 9. Upper glume very short; spikes long and flexuous, very slender
Psilurus
 9. Upper glume well developed; spikes straight, simple or abnormally paniced, stout
Lolium
 6. Inflorescence a true panicle:—
 10. Lemmas firmly keeled on the back:—
 11. Spikelets broadly ovate, pendulous; lemmas inflated, awnless, cordate at the base, closely imbricate, boat-shaped, many-nerved, horizontally spreading
Briza
 11. Spikelets and lemmas not as above:—
 12. Lemmas strongly 5-nerved, subcartilaginous at the base, herbaceous or hyaline above, obtuse
Sclerochloa
 12. Lemmas not as above:—
 13. Spikelets borne in dense one-sided clusters on the branches of a panicle; lemmas tipped with a rather stout awn up to 1.5 mm long; tufted perennials
Dactylis
 13. Spikelets borne in loose or contracted panicles; lemmas not awned
Poa
 10. Lemmas rounded on the back:—
 14. Florets with one stamen; panicle rather dense, erect, of long-awned spikelets
Vulpia
 14. Florets with three stamens:—
 15. Lemmas rounded, hyaline at the apex:—
 16. Lower glume not more than 1 mm long, almost orbicular; upper same shape, larger, almost nerveless
Catabrosa
 16. Glume not orbicular, larger:—
 17. Glumes shorter, often much shorter than the lowest lemma
Puccinellia
 17. Glumes at least half as long as the lowest lemma, or as long as or longer than the spikelet
Colpodium

15. Lemmas apiculate, acute or awned:—
 18. Delicate annuals; lemmas rolled, acute or acuminate; hilum punctiform **Eremopoa**
 18. Perennials; lemmas chartaceous to cartilaginous, awned or awnless; hilum linear, length of the grain **Festuca**
 5. Spikelets 1-flowered, disarticulating below the glumes, sub-circular in outline, sessile, imbricate, secund in 2-rows along a continuous rhachis; the spikes paniced **Beckmannia**

Beckmannia Host, Gram. Austr. 3, 5 (1805), t. 6.

Bruchmannia Nutt., Gen. Am. 1, 48 (1818).

Joachimia Ten. ex Roem. et Schult., Syst. Veg. 2, 695 (1817).

1. **Beckmannia syzigachne** (Steud.) Fernald in Rhodora 30, 27 (1928).
Panicum syzigachne Steud. in Flora 29, 19 (1846).
Beckmannia erucaeformis var. *uniflora* Scribn. ex A. Gray, Man. ed. 6, 628 (1890).

Distribution: U.S.A. and Asia at temperate altitudes.

This species is palatable to stock. In the U.S.A. it is made into hay. $2n = 14$ (Tateoka).

J. G. Reeder in Torr. Bot. Club 80, 187 (1953) concludes from a study of the embryo of this species that it is better placed in *Agrostideae*: it had formerly been placed in *Chlorideae* and *Paniceae*.

Exsicc.—H. J. Walton s.n., Gyantse, Tibet.

Briza Linn., Gen. Pl. ed. 5, 32 (1754) et in Sp. Pl. ed. 1, 70 (1753).

Key to the species of *Briza*
 (after C. E. Hubbard)

1. Spikelets large, 10–20 mm long by 8–15 mm wide, 7–17-flowered; panicle nodding, few-spiculate; annual **B. maxima**
 1. Spikelets much smaller, 4–12-flowered; panicles erect, composed of numerous spikelets:—
 2. Annual; uppermost ligule up to 8 mm long; tips of lemmas becoming inflexed at maturity; anthers up to 0.5 mm long **B. minor**
 2. Perennial; uppermost ligules 1–2 mm long; tips of lemmas not becoming inflexed; anthers about 2 mm long **B. media**

1. **Briza maxima** Linn., Sp. Pl. ed. 1, 70 (1753).

Distribution: Native of the Mediterranean Region, sometimes cultivated for ornament in India, and found as an escape.

Exsicc.—J. S. Gamble 15283, Madras; Bourne 5315, Nilgiris. $2n = 14$.

MM

2. *Briza media* Linn., Sp. Pl. ed. 1, 70 (1753).

Distribution: Throughout Europe, North Asia and north-west India.

3. *Briza minor* Linn., Sp. Pl. ed. 1, 70 (1753).

Distribution: Native of the Mediterranean Region but introduced into many countries and often found as an escape in temperate situations.

Exsicc.—Bourne 1002, Pulneys, Madras; F. Ballard 1165, Ceylon.
2n = 10.

Castellia Tineo, Pl. Rar. Sicil. 2, 17 (1846).

1. *Castellia tuberculosa* (Moris) Bor in Indian For. 74, 90 (1948).

Catapodium tuberosum Moris in Atti Terz. Riun. Sc. Ital. 481 (1841).

Castellia tuberculata Tineo, Pl. Rar. Sicil. 2, 18 (1846).

Festuca tuberculosa (Moris) Coss. et Dur., Fl. d'Algér. Glum. 189 (1856), t. 14.

F. tuberculata Benth. in J. Linn. Soc. (Bot.) 19, 128 (1881).

Desmazeria tuberculosa (Moris) Battand. et Trabut, Fl. d'Alger, Monocots. 100 (1884).

Micropyrum tuberosum (Moris) Pilger in Bot. Jahrb. 74, 567 (1949).

Distribution: North Africa, Canary Isles, Sicily, Sardinia, Greece, Arabia, Sudan. Common along the railway line, Cambellpur, Punjab.

Link raised the section *Micropyrum* Gaud. of the genus *Triticum* to generic rank in *Linnaea* 17, 397 (1843) and based it upon the species *Triticum tenellum* Linn. This seems to be quite justified, but to include in *Micropyrum*, as typified by *M. tenellum* (Linn.) Link, the very different species and genus *Castellia tuberculosa* (Moris) Bor, as Pilger has done, seems to be unduly stretching the limits of the genus.

Exsicc.—R. R. Stewart 23309, Punjab.

Catabrosa P. Beauv., Ess. Agrost. 97 (1812), t. 19, f.8.

Key to the species and varieties of *Catabrosa*

1. Panicle up to 20 cm, open, loose, branches at length deflexed; spikelets 1-3-flowered, green or yellow *C. aquatica*
2. Branches of the panicle long, up to 10 cm long; lemmas 2.5 mm long var. *aquatica*
2. Branches of the panicle very short, not over 5 cm long; lemmas 1.5-1.7 mm long var. *angusta*
1. Panicle about 6 cm long, 2 cm broad, very loose; branches short; spikelets purple *C. sikkimensis*
1. *Catabrosa aquatica* (Linn.) P. Beauv., Ess. Agrost. 97 (1812), t. 19, f.8.
Aira aquatica Linn., Sp. Pl. ed. 1, 64 (1753).
Poa airoides Koel., Descr. Gram. 194 (1802).
Glyceria aquatica (Linn.) J. S. et C. B. Presl, Fl. Čech. 25 (1819).

Colpodium aquaticum Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 1, 395 (1830).

var. **aquatica**.

Distribution: Europe. Temperate Asia and North America.

Found exclusively in marshy, muddy places and on the margins of pools and slow-moving streams in the hills. It is sought after and greedily eaten by grazing animals. $2n = 20$.

Exsicc.—W. Koelz 2602, Ladak, Kashmir; J. F. Duthie 8732, Baluchistan.

var. **angusta** Stapf in Hook. f., Fl. Brit. Ind. 7, 311 (1896).

Distribution: Western Tibet.

Found in similar situations as the type. It has, however, a different facies and may eventually be recognized as a distinct species.

Exsicc.—T. Thoms. s.n., Western Tibet.

2. **Catabrosa sikkimensis** Stapf ex Hook. f., Fl. Brit. Ind. 7, 311 (1896).

Distribution: Alpine Sikkim.

Exsicc.—G. A. Gammie 894, Sikkim 5000 m.

Colpodium Trin., Fund. Agrost. 119 (1820).

Key to the species of *Colpodium*

1. Glumes shorter than the lowest lemma:—
 2. Inflorescence spicate; spikelets congested; lower glume 2.5 mm; upper glume 3 mm; lemma 4 mm long *C. himalaicum*
 2. Inflorescence paniculate; lower glume 2.5 mm; upper glume 3 mm; lemma 4.5 mm long *C. nutans*
1. Glumes longer than the lemma:—
 3. Spikelets 4–5 mm long, almost black or blackish-purplish *C. tibeticum*
 3. Spikelets 3.5 mm long, brown *C. wallichii*

1. **Colpodium himalaicum** (Hook. f.) Bor, comb nov.
Phippsia himalaica Hook. f., Fl. Brit. Ind. 7, 240 (1896).
Catabrosa himalaica (Hook. f.) Stapf in Hook. f., loc. cit. 311.
Colpodium trollii Pilger in Notizb. Bot. Gart. Berlin. 14, 344 (1939).
Catabrosa trollii (Pilger) R. R. Stewart in Brittonia 5, 424 (1945).

Distribution: North-west India.

This species grows at high altitudes (over 4000 m). *C. trollii* is placed here doubtfully. The type has been destroyed but the spikelet measurements as given by Pilger agree with this species.

Exsicc.—R. R. Stewart 19971, Kashmir; J. F. Duthie 12160, Baltistan.

2. **Colpodium nutans** Griseb., in Goett. Nachr. 76 (1868).
Catabrosa nutans (Griseb.) Stapf in Hook. f., Fl. Brit. Ind. 7, 312 (1896).

Graphephorum nutans Munro ex Duthie, Grasses N.W. India 41 (1883) nomen.

Distribution: North-west India at very high altitudes.

Exsicc.—N. L. Bor 15475, Lahul; J. F. Duthie 292, Tehri; J. F. Duthie 13424, Kashmir.

3. *Colpodium tibeticum* Bor in Kew Bull. 1953, 270 (1953).

Distribution: Monyül, South Tibet.

Exsicc.—Kingdon-Ward 11688, Tulung La, 4000–5000 m alt.; “chiefly in moist places, where water is trickling down a stone slide”.

4. *Colpodium wallichii* (Hook. f.) Bor in Kew Bull. 1953, 270 (1953).
Catabrosa wallichii Hook. f., Fl. Brit. Ind. 7, 312 (1896).

Distribution: Appears to be endemic in the high mountains to the north of Nepal.

Exsicc.—O. Polunin 282, Nepal; Wallich 8907, Nepal.

Cynosurus Linn., Gen. Pl. ed. 5, 33 (1754) et in
Sp. Pl. ed. 1, 72 (1753).

Falona Adans., Fam. 2, 496 (1763).

Phalona Dum., Obs. Gram. Belg. 86, 114 (1823).

Key to the species of *Cynosurus*

1. Annuals; awns evident: panicles congested *C. echinatus*
1. Perennials; awns inconspicuous; panicles spike-like *C. cristatus*
1. *Cynosurus cristatus* Linn., Sp. Pl. ed. 1, 72 (1753).
Distribution: Europe, but introduced with grass seed into India.
Known as “Crested Dogtail” in Europe, it is cultivated as a mixture in meadows, but it is of little value. $2n = 14$.
2. *Cynosurus echinatus* Linn., Sp. Pl. ed. 1, 72 (1753).
Phalona echinata (Linn.) Dum., Obs. Gram. Belg. 114 (1823).
Distribution: Europe, but introduced with grass seed into India.
Not of much account as fodder. $2n = 14$.

Dactylis Linn., Gen. Pl. ed. 5, 32 (1754) et in
Sp. Pl. ed. 1, 71 (1753).

Amaxitis Adans., Fam. 2, 34 (1763).

1. *Dactylis glomerata* Linn., Sp. Pl. ed. 1, 71 (1753).
Bromus glomeratus (Linn.) Scop., Fl. Carn. ed. 2, 1, 76 (1772).
Festuca glomerata (Linn.) All., Fl. Pedem. 1, 252 (1785).
Trachypoa vulgaris Bubani, Fl. Pyr. 4, 359 (1901).
Distribution: Europe, North Africa, Temperate Asia and introduced in many other temperate regions.



Fig. 58. *Dactylis glomerata* Linn. subsp. *himalayensis* Domin
 1, plant and inflorescence $\times \frac{1}{4}$; 2, spikelet in side view; 3, lower glume; 4, upper glume; 5, lowest lemma; 6, ligule; 7, stamens, ovary and lodicules; 8, grain showing left, the hilum and right, the embryo; all $\times 8$.

A very important pasture and hay grass grown in many Government hill farms. The Indian specimens differ somewhat from the European and may represent a distinct species. The lemmas are in many specimens definitely awned and more acuminate.* In Europe the chromosome number is $2n = 28$.

Exsicc.—N. L. Bor 14088, Lahul; R. N. Parker 3428, Simla; W. Koelz 21708, C. B. Clarke 26764, Sikkim.

Eremopoa Roshev. in Komarov, Flor. U.R.S.S.,
2, 429, 756 (1934).

Key to the varieties of *Eremopoa persica*

1. Tip of the lemma seen from the side oblique, abruptly tapering to an acute tip *E. persica* var. *persica*
1. Tip of the lemma gradually tapering to an acute tip. *E. persica* var. *songarica*

1. **Eremopoa persica** (Trin.) Roshev. in Komarov, Fl. U.S.S.R. 2, 430 (1934).

var. **persica**.

Poa persica Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 1, 373 (1830).

Festuca polygama C. Koch in Linnaea 21, 409 (1848).

F. persica (Trin.) C. Koch in loc. cit. 410.

F. heptantha C. Koch in loc. cit. 410.

Nephelochloa persica (Trin.) Griseb. in Ledeb., Fl. Ross. 4, 366 (1853).

Aira altaica Trin. in Bunge, Verz. Alt. 4 (1836).

Poa heptantha (C. Koch) Steud., Syn. Pl. Glum. 1, 255 (1854).

Distribution: Mediterranean Region, Syria, Persia, West Himalaya, mountains of South Russia.

The species is often gregarious over considerable areas at high altitudes. Exsicc.—N. L. Bor 14578, Lahul; W. Koelz 2865, Zaskar, Kashmir.

var. **songarica** (Schrenk) Bor, comb. nov.

Eremopoa songarica (Schrenk) Roshev. in Komarov, Fl. U.S.S.R. 2, 431 (1937).

Glyceria songarica Schrenk, Enum. Pl. Nov. 1, 1 (1841).

Nephelochloa songarica (Schrenk) Griseb. in Ledeb., Fl. Ross. 4, 367 (1853).

Poa songarica Boiss., Fl. Orient. 5, 611 (1884).

P. persica var. *songarica* (Schrenk) Hook. f., Fl. Brit. Ind. 7, 337 (1896).

Distribution: Western Himalaya, mountains of Southern Russia.

Found in gregarious masses.

Exsicc.—Griffith 182, Afghanistan; R. R. Stewart 22204a, Kashmir.

* The Himalayan form of *Dactylis glomerata* Linn. was considered by Domin, in Act. Bot. Bohem. 14, 129 (1943), to be a distinct subspecies, which he named *D. glomerata* Linn. subsp. *himalayensis* Domin.

Festuca Linn., Gen. Pl. ed. 5, 33 (1754) et in
Sp. Pl. ed. 1, 73 (1753).

Key to the species and varieties of *Festuca*

1. Leaves involute or convolute, broad or narrow, finally flat, at least 3 mm broad:—
 2. Lemmas hairy; lower glume 3–4 mm long; upper glume 3.5–5 mm long; lemma 4.5–6 mm; anthers 2.5–3 mm long
F. rubra var. *villosa*
 2. Lemmas not hairy:—
 3. Top of the ovary glabrous:—
 4. Bases of the leaves biauriculate; auricles falcate, clasping the stem:—
 5. Lemmas awned, the awns 10–18 mm long; auricles quite glabrous; leaf-blades bright green, glossy beneath, 6–18 mm wide
F. gigantea
 5. Lemmas awnless or with awns 4 mm or less long:—
 6. Auricles minutely ciliate; short panicle branch of each pair bearing 3 or more spikelets; leaves green or somewhat glaucous
F. arundinacea
 6. Auricles quite glabrous; short panicle branches bearing 1 or 2 spikelets only; leaves green, glossy below
F. pratensis
 4. Bases of leaves not at all auriculate
F. undata
 3. Top of the ovary hispidulous; bases of the leaves devoid of auricles:—
 7. Glumes very short, broad, scale-like, obtuse; the lower not more than 1 mm long; the upper not exceeding the base of the second lemma
F. parvigluma
 7. Glumes not as above, much longer:—
 8. Anthers 2–3 mm long
F. rubra
 8. Anthers 1.5–2 mm long:—
 9. Panicle linear, somewhat strict, subsecund, 10–15 cm long; undate, flexuose; lower glume 2.5–3 mm; upper 3.5–4 mm; lemmas 6 mm long; anthers 1.5–2 mm long:—
 10. Culms scabrid below the panicle; awn of lemma 1.5 mm long or less
F. undata var. *undata*
 10. Culms smooth below the panicle; awn of lemma 6 mm long
F. undata var. *aristata*
 9. Panicle lax, effuse or widely spreading:—
 11. Lemmas awnless; ligules long:—
 12. Anthers longer than half the palea, 4 mm long; glumes broadly elliptic-acute, the lower 4.5 mm, the upper 5–6 mm long; lemmas 7–7.5 mm long, membranous; side nerves prominent; ligules 5–8 mm long, fimbriate or split into fibres
F. lucida

12. Anthers less than half the palea in length, 2.5 mm long; glumes subulate; lemmas up to 9 mm long, membranous, hyaline; ligule up to 5 mm long
F. modesta (*F. asthenica*)
11. Lemmas awned; lower glume 1.5–2.5 mm long, triangular-acuminate, margins white hyaline; upper glume 2.5–3 mm long; lemma 6.5–7 mm long, smooth and glabrous; ligule very short; resembles a *Bromus* superficially
F. leptopogon
1. Leaves, especially those of the vegetative shoots, tightly folded; if flat, then under 3 mm wide:—
13. Top of the ovary hairy or hispid (very few hairs in *F. nitidula*):—
14. Lemmas acute or mucronate, not awned; anthers longer than half the length of the palea; panicle 10–15 cm long, very loose, lower branches geminate, long, slender; spikelets variegated yellow and purple
F. altaica
14. Lemmas awned, or if awnless then anthers minute; anthers less than half the length of the palea or equal to it:—
15. Anthers very minute, 0.5–0.6 mm long; lower glume 2–3 mm long; upper glume 3.5–4 mm long; lemma 3.5–4.5 mm long; leaves setaceous, ending in a sharp point; culms 1-noded
F. nitidula
15. Anthers much longer, 1–4 mm long:—
16. Anthers not more than 1.5 (2 mm) long; panicle 10–15 cm long, very narrow, just exerted from or partly enclosed in the uppermost leaf-sheath, flaccid and flexuous; lower branches geminate; lower glume 2–2.5 mm long; upper glume 3–3.5 mm long; lemma 5–5.5 mm long:—
17. Lemmas not awned
F. undata var. *undata*
17. Lemmas awned
F. undata var. *aristata*
16. Anthers 2–3 mm (or more) long; panicle somewhat effuse 5–20 cm long, well exerted from the topmost sheath:—
18. Anthers up to 3 mm long:—
19. Lower glume 3–3.5 mm long; upper glume 4–4.5 mm long; lemma 5–7.5 mm long, shining, very smooth and glabrous; nerves of lemma inconspicuous; lower branches solitary, rarely geminate
F. kashmiriana
19. Lower glume 5–6 mm long, subulate; upper glume 7 mm long, subulate-lanceolate; lemma 7 mm long; awn 4–6 mm long; anthers 2.5–3 mm long
F. rubra var. *clarkei*
18. Anthers 4 mm long; lower glume 4 mm long; upper glume 5 mm; lemmas 6–6.5 mm long; awn 1–1.5 mm long; panicle loose
F. alata
13. Top of the ovary glabrous:—
20. Lemmas not awned, mucronate; panicle 5–7.5 cm long, 1 cm

- broad, linear, strict; anthers about 1 mm long; lower glume 2.5 mm long; upper glume 3 mm long; lemma 3.5 mm long, acute, acuminate or mucronate *F. levingei*
20. Lemmas awned; panicle longer and broader or narrow and strict (*F. ovina*, *F. ovina* var. *valesiaca* and *F. polycolea* var. *brevis*):—
21. Panicle linear, not more than 1 cm broad:—
22. Panicle dense, linear, 2–2.5 cm long, 1 cm broad; spikelets elliptic-lanceolate, variegated purple; lower glume 2 mm long; upper glume 3 mm long; lemma 4 mm long, strongly involute; awn of lemma less than half the length of the palea; anthers 1–1.25 mm long *F. ovina*
22. Panicle linear, not dense, 2–2.5 cm long, 0.5 cm or less wide:—
23. Lower glume 2.5–3.5 mm long; upper glume 3.5–4 mm long; lemma 4–4.5 mm long; awns equal to half the lemma or more; anthers 1.5–1.75(2) mm long, shorter than the deeply bifid palea; palea scabrid all along the keels *F. polycolea* var. *brevis*
23. Lower glume 2.25 mm long; upper glume 3 mm long; lemma 3–3.5 mm long; awn less than half the lemma; anthers 1–1.5 mm long; palea not longer than the lemma, scabrid in the upper third *F. ovina* var. *valesiaca*
21. Panicle not linear or dense, much longer and broader:—
24. Panicle 5–7 cm long, with a stiff, erect, characteristically undulate axis with usually solitary, short branches, dividing once or twice and carrying a spikelet or two; lower glume 2.5 mm long; upper glume 3 mm long; lemma 4–5 mm long; anthers 1.5 mm long; palea deeply divided; anthers shorter than half the palea *F. polycolea*
24. Panicle not stiff, erect, but nodding and often widely spreading:—
25. Anthers longer than half the lemma; lemmas most often slightly to very hairy; lower glume 3–4 mm long; upper glume 3–4.5 mm long; lemmas 4.5–6 mm long; anthers 2–3 mm long; lemmatal nerves very inconspicuous; culm decumbent at the fibrillose usually reddish base; culms 2-noded; nodes in lower third or quarter; auricles not present *F. rubra*
26. Slender creeping rhizomes present var. *rubra*
26. Rhizomes absent var. *fallax*
25. Anthers less than half the length of the lemma; lemmas glabrous; lower glume 2–3 mm long; upper glume 3–4 mm long, broadly lanceolate, 1–1.5 mm wide; lemma 5–6 mm long; anthers 1.5–1.75 mm long; auricles present, 1 mm long, erect *F. cumminsii*

The arrangement of the sclerenchymatous tissue in the leaves is an important diagnostic character which can be used to confirm an identification obtained by the use of the key above. Another feature made use of in the following keys (adapted from St. Yves) is the state of the sheath, whether these are open or closed, and if the latter, by how much.

Sections of the leaves from the innovation shoots should be made and stained in an alcoholic solution of safranin.

The feature of the closed sheath is more difficult to make out as the tissue which joins the margins is often only a few cells thick; careful manipulation under a lens with the aid of two needles is the only way.

Key to the Indian species of *Festuca*
(after St. Yves)

1. Dioecious grasses *F. sibirica* (*Leucopoa sibirica*)
1. Hermaphrodite grasses:—
 2. Vernation conduplicate; blades more often complicate-setaceous, more rarely, especially those of the culm, with bulliform cells and then flat or more or less broadly canaliculate:—
 3. Blades with sclerenchymatous fibres continuous or with three bands only (1 median, 2 lateral), rarely with 2 more slender strands:—
 4. Sclerenchymatous fibres of the upper and lower leaves girder-shaped; top of the ovary hispidulous:—
 - Anthers about one-third the length of the palea *F. undata*
 - Anthers longer than half the palea *F. altaica*
 4. Sclerenchymatous fibres of the upper leaves (when present) never, those of the lower blades sometimes, confluent with the nerves; top of the ovary very glabrous:—
 5. Innovations mixed, extravaginal surculi rare; ligule of the innovations reduced to a scarious rim, that of the culms unequally 2-auricled; blades at least those of the culms, with bulliform cells and therefore flat; fibres in three bands *F. cumminsii*
 5. All innovations intravaginal; all the ligules equally biauriculate; blades complicate-setaceous, always without bulliform cells; sclerenchymatous fibres in a continuous band, or 3 distinct or 2 very slender strands *F. ovina* s.l.
 3. Blades with sclerenchymatous fibres separated, corresponding to the nerves, plus two at the margins:—
 6. Anthers much shorter than half the palea:—
 7. Ovary very glabrous *F. ovina* s.l.
 7. Ovary hispid at the top:—
 8. Blades capillary with nerves completely free; no sclerenchymatous fibres above *F. nitidula*

8. Blades thick, about 1 mm thick; sclerenchymatous fibres above free, the lower confluent with some nerves
F. rubra var. *clarkei*
6. Anthers half as long as the palea or longer:—
9. Ovary very glabrous *F. rubra* s.l.
9. Ovary hispid at the top *F. rubra* s.l. (ssp. *alataavica*)
2. Vernation convolute; blades with bulliform cells and therefore flat or convolute when dry:—
10. Glumes very short, broadly oblong-obtuse, lower not more than 1 mm long, the upper not exceeding the base of the second lemma; lemmas entire at tip *F. parvigluma*
10. Glumes not as above, rarely very short but then subulate and 2-toothed at the apex:—
11. Blades thin, flaccid, with scarcely prominent nerves with bulliform cells completely filling the sinus:—
12. Ovary very glabrous; blades with two falcate auricles at the base clasping the culm *F. gigantea*
12. Ovary hispidulous at the top; base of the blades without auricles:—
13. Ligule 5 mm long; anthers longer than half the palea *F. lucida*
13. Ligule short, truncate; anthers much shorter than half the palea:—
14. Lemmas long-aristate; awn equal to or longer than the lemma:—
15. Panicle large, lax, up to 25 cm long *F. leptopogon*
15. Panicle dense, strict *F. undata*
14. Lemmas muticous or very shortly awned:—
16. Panicle strict, dense *F. undata*
16. Panicle ample, lax; spikelets large, up to 14 mm long *F. modesta*
11. Blades thick, rigid, with prominent nerves
F. subspicata (*Leucopoa karataavica*)

1. ***Festuca alataavica* (Hack.) Roshev.** in Komarov, Fl. U.R.S.S. 2, 528 (1934).

Festuca rubra Linn. subsp. *alataavica* Hack. in St. Yves in Candollea 3, 393 (1928).

F. violacea var. *alataavica* Hack. nomen in sched.

Distribution: A south Russian species and likely to be found in the Himalaya.

2. ***Festuca altaica* Trin.** in Ledeb., Fl. Alt. 1, 109 (1829).

Distribution: Himalaya at very high altitudes, Central Asia to Siberia.

A tufted grass with very tough rhizomes found c. 3000–4000 m.

Exsicc.—J. F. Duthie 13790, Baltistan; C. B. Clarke 30252, Karakoram.

10. **Festuca modesta** Steud., Syn. Pl. Glum. 1, 316 (1854).
Schedonorus modestus Nees ex Steud., loc. cit. 316.
Festuca asthenica Hook. f., Fl. Brit. Ind. 7, 354 (1896).

Distribution: West Himalaya.

Apart from the small size of the plant and spikelet-parts I am unable to find any specific differences between *F. asthenica* and *F. modesta*.

Exsicc.—J. S. Gamble 23780, Jaunsar; Royle s.n., northwest India.

11. **Festuca nitidula** Stapf in Hook. f., Fl. Brit. Ind. 7, 350 (1896).

Distribution: High altitudes in the Himalaya and Tibet.

Exsicc.—Strachey et Winterbottom 1, Kumaon; T. Thoms. s.n., Western Tibet.

12. **Festuca ovina** Linn. Sp. Pl. ed. 1, 73 (1753) sensu lato.

F. valesiaca Schleich. ex Gaud., Agrost. Helvet. 1, 242 (1811).

Distribution: Widely distributed in temperate lands throughout the world, ascending mountains in tropical countries.

The *Festuca valesiaca* Schleich. of the *Flora of British India* is considered by St. Yves to be a subspecies of the Linnean *F. ovina*. The following key is adapted from St. Yves' work and indicates his treatment of the Indian subspecies of *F. ovina*.

Key to the subspecies of *Festuca ovina* Linn., s.l.

1. Sclerenchymatous bands continuous and everywhere of the same thickness ssp. *polycolea* (*F. polycolea*)
 1. Sclerenchymatous bands not as above:—
 2. Bands separated, 1 median, 2 lateral, with sometimes two much thinner bands, or confluent in one band but then not everywhere of the same thickness, much thicker on the back and margins:—
 3. Anthers about one-third the length of the palea ssp. *coelestis* (*F. valesiaca* var. *tibetica*)
 3. Anthers longer than half the length of the palea:—
 4. Blade with 1 rib within ssp. *laevis* (*F. valesiaca*)
 4. Blade with 3 ribs within:—
 5. Blades usually scabrid, 5-nerved; sheaths open to the base subsp. *sulcata* var. *valesiaca* (*F. valesiaca*)
 5. Blades usually smooth, 7-nerved; sheaths entire for one-third or more ssp. *laevis*
 2. Bands separated, corresponding to the nerves of the margins:—
 6. Panicle ovate, very lax, spreading, few-spiculate; anthers shorter than half the palea ssp. *remota*
 6. Panicle not as above; anthers longer than half the length of the palea ssp. *sulcata*
- ssp. *coelestis* St. Yves in Candollea 3, 376 (1928).
F. valesiaca Schleich. ex Gaud., Agrost. Helvet. 1, 242 (1811) var. *tibetica* Stapf in Hook. f., Fl. Brit. Ind. 7, 349 (1896).

Distribution as above.

Exsicc.—*N. L. Bor* 16489a, Lahul; *C. B. Clarke* 29002, Kashmir, $2n = 42$.
var. **fallax** (*Thuill.*) *Hack.*, Monogr. Fest. Europ. 142 (1882).

F. fallax *Thuill.*, Fl. Par. ed. 2, 50 (1799).

Distribution: Probably the same as that of var. *rubra*, but it is not often collected so as to show the absence of rhizomes. $2n = 42$.

var. **clarkei** *Stapf* in Hook. f., Fl. Brit. Ind. 7, 353 (1896).

Distribution: Khasia.

Exsicc.—*C. B. Clarke* 43942, Khasia.

var. **villosa** *Mert. et Koch ex Roehl.*, Deutsch. Fl. ed. 3, 1, 654 (1823).

Distribution: As for var. *rubra*, very common in the western Himalaya.

Exsicc.—*N. L. Bor* 16436 and several other numbers, Lahul.

Key to the subspecies of *Festuca rubra* s.l.
(after St. Yves)

1. Sclerenchymatous bands inferior, never confluent with the nerves, absent above the nerves:—
 2. Anthers shorter than half the palea; blades with three bands of sclerenchymatous fibres
ssp. *schlaginweitii* (*F. cumminsii*)
 2. Anthers longer than half the palea:—
 3. Sheaths closed to the middle; apex of the ovary densely hispid
ssp. *kashmiriana* (*F. kashmiriana*)
 3. Sheaths closed to the mouth; ovary glabrous or thinly hispidulous at the top
F. rubra
1. Sclerenchymatous bands confluent with the nerves below; separated from the nerves above:—
 4. Anthers shorter than half the length of the palea
ssp. *clarkei* (*F. rubra* var. *clarkei*)
 4. Anthers longer than half the length of the palea
ssp. *alataavica* (*F. alataavica*)

ssp. **alataavica** (*Hack.*) *St. Yves* in Candollea 3, 393 (1928).

Festuca alataavica (*Hack.*) *Roshev.* in *Komarov*, Fl. U.R.S.S. 2, 528 (1934).

Distribution: A south Russian species likely to be found in the Himalaya.

ssp. **clarkei** *St. Yves* in loc. cit. 398 var. **stapfiana** *St. Yves*, loc. cit. 398.

F. rubra var. *clarkei* *Stapf* in Hook. f., Fl. Brit. Ind. 7, 353 (1896).

Distribution: Khasi Hills.

Exsicc.—*C. B. Clarke* 43942, Khasia.

ssp. **rubra**.

Distribution: Widely distributed in the Northern Hemisphere.

Exsicc.—*N. L. Bor* 16489a, Lahul.

ssp. **kashmiriana** (*Stapf*) *St. Yves* in Candollea 3, 395 (1928).

F. kashmiriana *Stapf* in Hook. f., Fl. Brit. Ind. 7, 351 (1896).

Distribution: Temperate and alpine Himalaya.

Exsicc.—*N. L. Bor* 15373, Lahul.

ssp. **schlagintweitii** St. Yves in Candollea 3, 389 (1928).

F. cumminsii Stapf in Hook. f., Fl. Brit. Ind. 7, 349 (1896).

Distribution: In Sikkim, endemic.

Exsicc.—H. A. Cummins s.n., Sikkim.

17. **Festuca undata** Stapf in Hook. f., Fl. Brit. Ind. 7, 350 (1896).

var. **undata**.

Distribution: Sikkim, Himalaya.

Exsicc.—Hook. f. s.n., Lachen, Sikkim.

var. **aristata** Stapf in loc. cit. 351.

Distribution: Sikkim.

Exsicc.—W. W. Smith 3640, Chamnago, Sikkim.

18. **Festuca valesiaca** Schleich. ex Gaud., Agrost. Helvet. 1, 242 (1811)
(see *F. ovina* Linn.).

F. ovina var. *valesiaca* Koch, Syn. ed. 1, 812 (1837).

var. **valesiaca**.

Distribution: All along the Himalaya at high altitudes.

This species forms tussocks and is grazed by yaks and sheep.

Exsicc.—J. F. Duthie 13343, Kashmir; W. Koelz 2046, Lahul; J. S. Gamble 24204, Tehri.

var. **tibetica** Stapf in Hook. f., Fl. Brit. Ind. 7, 349 (1896).

F. ovina subsp. *coelestis* St. Yves in Candollea 3, 376 (1928).

Distribution: Himalaya and Central Asia.

A dwarf grass growing towards the limit of vegetation, c. 5,000-6,000 m.

Exsicc.—Hook. f. s.n., Donkia La, 5100 m, Sikkim.

Fingerhuthia Nees ex Lehm. in Linnaea 10,

Litt.-Bericht, 112 (1836).

Lasiotrichos Lehm., Cat. Sem. Hort. Hamb. (1834) nomen.

1. **Fingerhuthia africana** Lehm., in Linnaea 10, Litt.-Bericht 112 (1836).

F. affghanica Boiss., Fl. Orient. 5, 569 (1884).

Distribution: Afghanistan and South Africa.

Aitchison found this species to be extremely common in eastern Afghanistan where it is one of the chief fodder grasses.

Exsicc.—Stewart 459, Peshawar.

Lamarckia Moench, Meth. 201 (1794).

Chrysurus Pers., Syn. 1, 80 (1805).

Pterium Desv. in J. de Bot. 1, 75 (1813).

1. **Lamarckia aurea** (Linn.) Moench, Meth. 201 (1794).

Cynosurus aureus Linn., Sp. Pl. ed. 1, 73 (1753).

Chrysurus cynosuroides Pers., Syn. Pl. 1, 80 (1805).

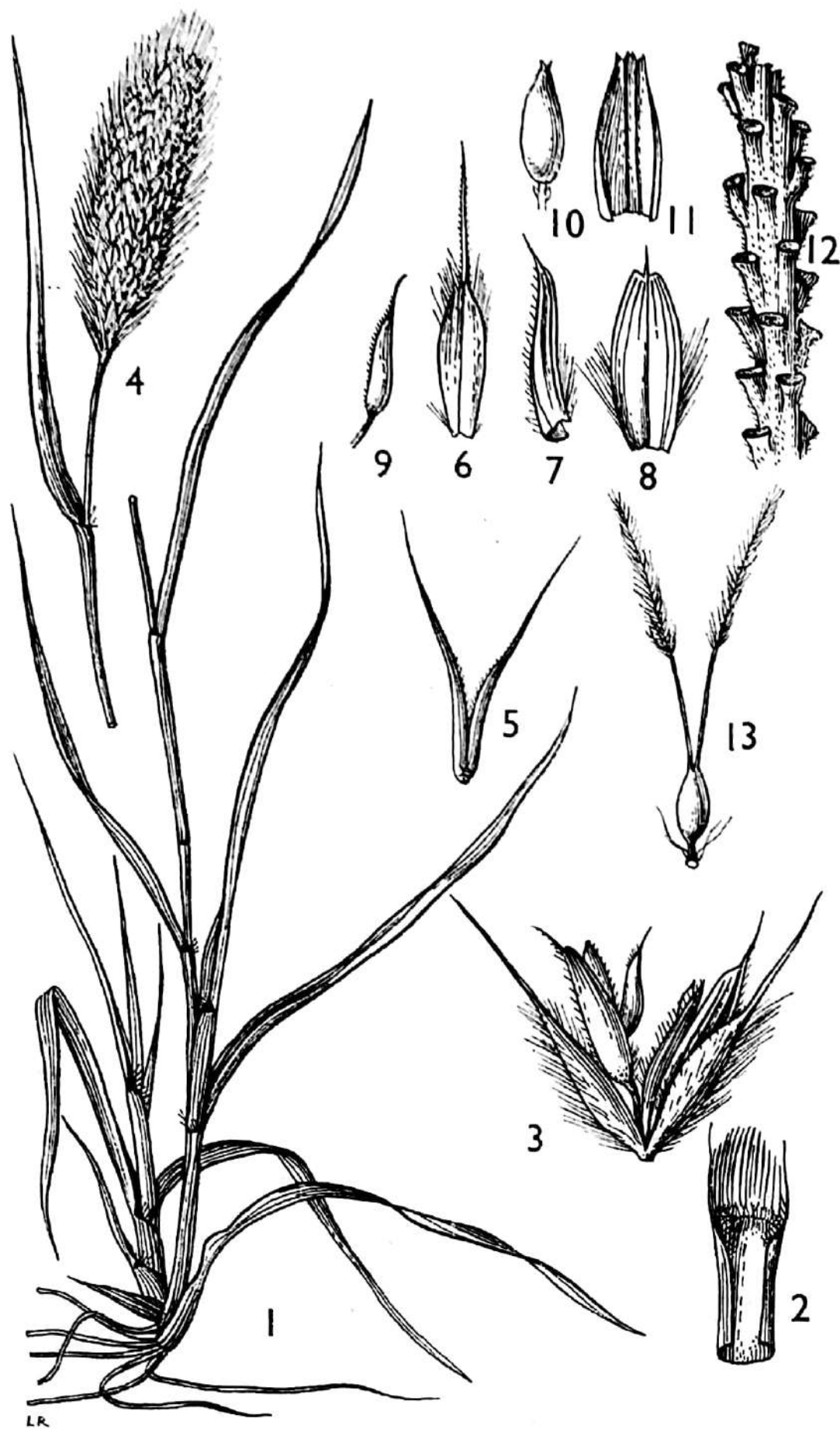


Fig. 59. *Fingerhuthia africana* Lehm.
 1, base of plant $\times 1$; 2, ligule $\times 2$; 3, single spikelet; 4, inflorescence, the spikelets fall off from above downwards; 5, sterile spikelets from the base of the inflorescence; 6, lower glume; 7 and 8, lowest lemma; 9, rudimentary floret terminating the rachilla; 10, grain; 11, palea of the lowest floret, all $\times 4$; 12, portion of the axis showing stump-like pedicels $\times 8$.

NN

Ch. aureus (Linn.) P. Beauv. ex Spreng., Syst. Veg. 1, 296 (1825).
Achyrodes aureum (Linn.) O. Ktze., Rev. Gen. Pl. 2, 758 (1891).

Distribution: Mediterranean Region eastwards to the Punjab.

A very handsome annual which is sometimes cultivated for ornament. It grows at Peshawar and in other places. There is probably not enough of it for it to be of any importance as a fodder grass.

Exsicc.—*Vicary* s.n., Peshawar; *Wingate* s.n., Saharanpur.

***Leucopoa* Griseb.** in Ledeb., Fl. Ross. 4, 383 (1852).

Key to the species of *Leucopoa*

1. Whole plant glaucous; glumes hyaline-membranous; lower 5 mm, the upper 6 mm long; lowest lemma 7 mm long, membranous, minutely hairy *L. albida*
1. Plant not glaucous; glumes membranous; lower 4 mm long, the upper 5 mm long; lowest lemma coriaceous, firm, glabrous, 5 mm long *L. karatavica*

1. ***Leucopoa albida* (Turcz.) V. Krecz. et Bobr.** in Komarov, Fl. U.S.S.R. 2, 495 (1934).

Poa albida Turcz. ex Trin. in Mém. Acad. Sci. Pétersb., sér. 6, 1, 387 (1831).

Leucopoa sibirica Griseb. in Ledeb., Fl. Ross. 4, 383 (1853).

Festuca sibirica Hack. ex Boiss., Fl. Orient. 5, 626 (1884).

Distribution: Southern Russia to the northwest Himalaya.

A very common grass in Lahul, growing on rocky, dry slopes or on the ledges of cliffs. It is sometimes found on steep, dry slopes where its strong root system helps to bind the soil.

Exsicc.—*N. L. Bor* 15073, Lahul; *Royle* s.n., northwest India.

2. ***Leucopoa karatavica* (Bge.) V. Krecz. et Bobr.** in Komarov, Fl. U.S.S.R. 2, 496 (1934).

Poa karatavica Bge. in Mém. Sav. Pétersb. 7, 525 (1851).

Festuca karatavica (Bge.) Fedtsch. in Bull. Jard. Bot. Pétersb. 14, Suppl. 2, 86 (1915).

F. subspicata (Regel) Lipsky in Act. Hort. Petrop. 26, 609 (1909) var. *griffithiana* St. Yves in Candollea 3, 423 (1928).

Distribution: Turkestan, northwest India.

Exsicc.—*Griffith* 6627, Afghanistan.

***Lolium* Linn.**, Gen. Pl. ed. 5, 36 (1754) et in
 Sp. Pl. ed. 1, 83 (1753).

Key to the species of *Lolium*
 (partly after C. E. Hubbard)

1. Upper glume usually much shorter (about half as long) than the spikelet; florets oblong or lanceolate-oblong, not turgid:—

2. Perennial; leaf-blades folded about the midrib when young; lemmas awnless, blunt or slightly pointed *L. perenne*
2. Annual or biennial; leaf-blades rolled when young; lemmas awned from near the tip *L. multiflorum*
1. Upper glume reaching nearly to or exceeding the uppermost lemma, at least more than half the length of the spikelet; florets elliptic to ovate, turgid or not, awnless or awned; annuals:—
 3. Spikelets awned:—
 4. Lemmas very turgid:—
 5. Lemmas 6–8 mm long, rounded on the back, awned from near the tip; awn up to 2 cm long *L. temulentum* var. *temulentum*
 5. Lemmas 3–4 mm long, awned; awn weak, flexuose, up to 5 mm long *L. remotum* var. *aristatum**
 4. Lemmas not turgid, 9–10 mm long or less, awned; awn up to 12 mm long *L. persicum*
 3. Spikelets not awned:—
 6. Spikelets very turgid:—
 7. Lemmas 6–8 mm long *L. temulentum* var. *arvense*
 7. Lemmas 3–4 mm long *L. remotum* var. *remotum*
 6. Spikelets not at all turgid; spikes very rigid *L. rigidum*

1. ***Lolium multiflorum* Lamk.**, Fl. Franç. 3, 621 (1778).

L. scabrum J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 267 (1830).

L. italicum A.Br. in Flora 17, 243 (1834).

Distribution: Central and Southern Europe, Northwest Africa and temperate parts of Asia. Introduced into the temperate parts of the world.

This species readily hybridizes with *Lolium perenne* and the result is considered to be a particularly valuable pasture grass. It is marketed in New Zealand as Short Rotation Rye Grass (H1). $2n = 14$.

Exsicc.—H. Deane s.n., Hazara.

2. ***Lolium perenne* Linn.**, Sp. Pl. ed. 1, 83 (1753).

L. brasilianum Nees, Agrost. Bras. 443 (1829).

Distribution: Widespread in Europe, North Africa and the temperate regions of Asia. It has been introduced into other parts of the world.

This species is a very valuable grazing and hay grass. $2n = 14$.

Exsicc.—R. R. Stewart 10619, Kashmir; Bourne 3638, Simla; J. S. Gamble 8038, Sikkim; J. S. Gamble 14310, Nilgiris.

3. ***Lolium persicum* Boiss. et Hoh. ex Boiss.**, Diagn. sér. 1, 13, 66 (1853).

Distribution: Iraq, Persia to Baluchistan.

Said to be common in meadow-land near water and doubtless a welcome fodder grass.

Exsicc.—Griffith 280, Afghanistan; Stocks s.n., Baluchistan; A. V. Monro s.n., Quetta.

* The variety *aristatum* has not so far been found in India.

4. **Lolium remotum** Schrank, Baier. Fl. 1, 382 (1789).

Distribution: Europe, South Russia, Persia, Afghanistan to northwest India.

Exsicc.—R. R. Stewart 6190, Punjab.

5. **Lolium rigidum** Gaud., Agrost. Helvet. 1, 334 (1811).

Distribution: Mediterranean Region, Persia, Iraq, northwest India.

The specimen called var. *duthiei* by Hook. f. in the *Flora of British India* 7, 364 (1896) is, I think, *L. persicum*.

Exsicc.—Griffith 621, Afghanistan.

6. **Lolium temulentum** Linn., Sp. Pl. ed. 1, 83 (1753).

Distribution: Native of the Mediterranean Region, now introduced into many lands.

Usually found as a weed in wheat fields. $2n = 14$. The grain is sometimes used as food but is known to have caused poisoning. The poisonous elements are considered to be two alkaloids, temulin and loliin, which are present in the grain.

var. **temulentum**.

Exsicc.—J. S. Gamble 24459, Dehra; J. R. Drummond 21384, Punjab.

var. **arvense** Lilj., Sv. Fl. 80 (1816).

L. arvense With., Arr. Brit. Pl. ed. 3, 2, 168 (1796).

Exsicc.—N. L. Bor 14475, Kulu; R. N. Parker s.n., Kangra.

Nardurus Reichb. ex Godron, Fl. Lorr. 3, 187 (1844).

Key to the species of *Nardurus*

1. Lower glume longer than lowest lemma; upper longer than the spikelet; lemmas scrobiculate, short-awned *N. orientalis*
1. Lower glume much shorter than the lowest lemma; upper shorter than the spikelet; lemma smooth and glabrous, with an awn as long as or longer than itself *N. maritimus*

1. **Nardurus maritimus** (Linn.) Murbeck, Contrib. Fl. Nord-Ouest Afrique 4, 25 (1900).

N. tenuiflorus (Schrader) Boiss., Fl. Or. 5, 632 (1884).

N. tenuiflorus var. *aristatus* Rouy, Fl. France 14, 300 (1913).

Festuca maritima Linn., Sp. Pl. ed. 1, 75 (1753).

Distribution: Mediterranean Region to northwest India.

This slender grass is often found on wall tops and in other dry places in its western homes and likely favours such places in India. The following note by C. E. Hubbard [*Proc. Linn. Soc.* 110 (1935–36)], is of interest in the nomenclatural history of the plant. "According to Munro (*Proc. Linn. Soc.* 6, 45 (1862) and Jackson [*Index Linn. Herb.* 76 (1912)] there is no specimen of *Festuca maritima* so named by Linnaeus in his herbarium. It should be noted, however, that Linnaeus, in his *Mant. Pl. Alt.* 325 (1771), refers *F. maritima* to *Triticum*, and the type-specimen is in the folder of

that genus in the Linnaean Herbarium. The specimen agrees with Linnaeus's description and is written up 'maritima 6' by Linnaeus, the number 6 indicating that it was the sixth species of *Festuca* in the *Species Plantarum*. On the back of the sheet is a copy of the diagnosis from that work and a queried reference to 'Gramen exile duriusculum maritimum Scheuch. Gr. 272'. Scheuchzer's description refers to *Catapodium loliaceum* Link; this was realized by Linnaeus, who excluded the reference to Scheuchzer in his *Mant. Pl. Alt.* 325. Mention may be made here that the description of *Festuca maritima* does not occur in the first edition of the '*Species Plantarum*' as originally printed; *Festuca incrassata* L. appears instead on page 75. This page was apparently cancelled and the description of *F. incrassata* replaced by that of *F. maritima*. Linnaeus may have received the specimen of *F. maritima* after the account of *Festuca* had been printed, as Loeffling collected it at Madrid in July 1752."

Exsicc.—J. F. Duthie 10811, Kashmir; J. J. Norris 63, Baluchistan.

2. *Nardurus* ^{*subulatus* (Banks et Soland.) Bor., comb. nov.} ~~*orientalis*~~ Boiss., Diagn., sér. 1, 7, 127 (1846). see addenda
Festuca allepica Hochst. in Steud., Syn. Pl. Glum. 1, 302 (1854).
F. orientalis (Boiss.) B. Fedtsch. in Ann. Hort. Petrop. 38, 128 (1924)
 non Kerner.
Lolium orientale (Boiss.) V. Krecz. et Bobr. in Komarov Fl. U.R.S.S. 2, 544 (1934).

Distribution: Persia, Afghanistan, Baluchistan.

Exsicc.—J. J. Norris 63, Quetta, Baluchistan.

Poa Linn., Gen. Pl. ed. 5, 31 (1754) et in
 Sp. Pl. ed. 1, 67 (1753).

Key to the species and varieties of *Poa*

1. Basal sheaths with a bulbous thickening at the base:—
 2. Lemmas entirely glabrous:—
 3. Panicle contracted; 1.5 cm long, 5 mm broad; branches very short; spikelets congested; very slender grass, up to 15 cm tall
P. glabriflora
 3. Panicle spreading, 4–6 cm long, 15–20 mm broad; branches up to 3 cm long, spreading; plants up to 40 cm tall
P. bactriana
 2. Lemmas with some hairs at least on side nerves and keels:—
 4. Lemmas 3.5–4 mm long; spikelets rarely show proliferation; a grass of dry arid places; no wool
P. sinaica
 4. Lemmas 2.5–3 mm long; spikelets almost always exhibit proliferation; a mesophytic grass; wool \pm present
P. bulbosa
1. Basal sheaths without any thickening at the base:—
 5. Lemmas with a hairy covering on the dorsal surface between the nerves, often this reduced to a few hairs at the base of the lemma and dorsal surface of lemma coarsely scabrid, rarely shiny:—

6. Spikelets ovate in outline; base thick due to numerous short persistent leaf-sheaths; keels of the palea long-ciliate below
6. Spikelets oblong, elliptic, lanceolate or wedge-shaped:— *P. alpina*
7. Inflorescence a spreading panicle:—
 8. Lower glume equal to or longer than the lowest lemma in the spikelet:—
 9. Lemmas hairy all over the dorsal surface; lowest lemma 2.5 mm long; spikelets 4.5 mm long *P. hirtiglumis*
 9. Lemmas hairy in lower half or less; lowest lemma 4 mm long; spikelets 6.5 mm long *P. eleanorae*
 8. Lower glume distinctly shorter than the lowest lemma:—
 10. Upper ligules short, under 1.5 mm long:—
 11. Tufted grasses; lower glume awl-shaped in profile:—
 12. Keels of the palea ciliate in the lower half; margins of lemmas and glumes narrowly hyaline; basal sheaths disintegrating into brownish fibres; spikelets up to 5 mm long; anthers 1 mm long; wool copious *P. burmanica*
 12. Keels of the palea scabrid; margins of lemmas and glumes broadly hyaline; basal sheaths many, scarious, straw-coloured; spikelets up to 7 mm long; anthers 2–2.5 mm long; wool scanty *P. polycolea*
 11. Not tufted; lower glume lanceolate, not awl-shaped; anthers 2–3 mm long; blades and sheaths crowded at base of culm; glumes and lemmas finely granulate *P. ludens*
 10. Upper ligules longer, over 1.5 mm long:—
 13. Lemmas very broadly hyaline; spikelets pale; basal sheaths scarious; rhachilla-joints not conspicuous *P. polycolea*
 13. Lemmas not very broadly hyaline, often purple; basal sheaths not scarious; rhachilla-joints sometimes conspicuous from side:—
 14. Lemmas more or less scabrid or dull all over the dorsal surface; ligule 2–3.5 mm long or more:—
 - 14a. Lemmas 5- or more-nerved, covered with a shaggy felt of hairs *P. polyneuron*
 - 14a. Lemmas 5-nerved; hairy covering often reduced to a few hairs at base:—
 15. Very slender grass; basal leaves setaceous; rhachilla-joints not conspicuous from the side; upper glume 3–3.5 mm long; lemma 4–4.5 mm long *P. pagophila*
 15. Robust grass; basal leaves flat; rhachilla-joints very conspicuous from side; upper glume

4.5–5 mm long; lemma 4–5 mm long

P. falconeri

14. Lemmas smooth, sometimes shining on the dorsal surface, but often glandular-punctulate; ligule up to 5 mm or more:—

16. Keels of the palea scabrid or \pm ciliate:—

17. Anthers over 2 mm long; wool present on callus; keels always definitely scabrid:—

18. Glumes and lemmas broadly hyaline on the margins; plants grey-glaucous; lemmas 6 mm long

P. nitide-spiculata

18. Glumes and lemmas not broadly hyaline; plant green; lemmas 4.5–5 mm long

P. falconeri

17. Anthers under 2 mm long; keels sometimes ciliate but state difficult to make out:—

19. Wool absent; lemmas 3.5–5.5 mm long; paleas scabrid or semi-pilose on the keels:—

20. Leaves narrow, 2.5 mm broad; keels of palea scabrid

P. asperifolia

20. Leaves broad, 7 mm broad; keels of palea semi-pilose

P. gammieana

19. Wool present, very copious; lemmas about 2.5 mm long, very rarely with a few hairs at the base; paleas ciliate on the keels

P. nepalensis

16. Keels of the palea ciliate below:—

21. Sheaths smooth; leaves narrow, 30 times as long as broad; panicle long-exserted; ligule membranous, up to 5 mm long; lemmatal nerves not particularly prominent; lower lemma at most 4 mm long; a western species

P. stapfiana

21. Sheaths scabrid or asperulous; leaves broader, 10 times as long as broad, acuminate; panicle not long-exserted; ligule up to 4 mm long; lemmatal nerves very prominent; lowest lemma 4.5–5 mm long; an eastern Himalayan species

P. gammieana

7. Inflorescence contracted, dense, at most 6 cm long, 1 cm broad:—

22. Dwarf plants, not above 15 cm tall, very glaucous or not glaucous; keels of palea semi-pilose; wool present

P. koelzii

22. Much taller as a rule, not glaucous; palea shortly semi-pilose, cilia often reduced to a few hairs, scabrid above; wool absent or very sparse

P. lahulensis

5. Lemmas not hairy between the nerves but occasionally scabrid
(*P. himalayana*):—
23. Anthers 2 mm long or over:—
24. Ligules short, not over 2 mm long; lemmas prominently
5-nerved:—
25. Lemmas completely glabrous:—
Lemmas 5.5 mm long, scabrid
Lemmas not above 4 mm long, smooth
25. Lemmas ciliate on keels and side nerves, smooth:—
Plant stoloniferous; rhachilla-joints over 1 mm long
Plants rhizomatous; rhachilla-joints very short
24. Ligules longer, 2.5–4.5 mm long; lemmas inconspicuously
5-nerved:—
26. Panicle contracted; branches erect; lemmas smooth, pale;
margins of upper glume ciliate below
26. Panicle lax; branches spreading; margins of upper glume
eciliate:—
27. Leaves soft, not glossy or coriaceous:—
28. Lemmas scabrid, broadly hyaline; glumes and lemmas
very dull, green or purplish
28. Lemmas smooth, hyaline on margins; glumes and lem-
mas shining, pale or yellowish; lemmas often with a
yellow streak below the hyaline portion
27. Leaves glossy, coriaceous, long-acuminate
23. Anthers under 2 mm long (or a little longer):—
29. Wool present on the callus:—
30. Ligules short, not more than 1 mm long; keels of palea
scabrid:—
31. Lower glume lanceolate, 1-nerved, 2–2.5 mm long; lem-
mas almost glabrous, hyaline at the tip only, distinctly
5-nerved
31. Lower glume awl-shaped, 3-nerved, 2.5–3 mm long;
lemmas ciliate on the keel and side nerves, hyaline in
upper quarter, faintly 5-nerved
30. Ligules over 1 mm long; or if less, keels of palea semi-pilose
or ciliate:—
32. Keels of palea ciliate below, scabrid above
32. Keels of palea either scabrid or ciliate throughout:—
33. Keels of palea ciliate throughout:—
34. Panicle-branches whorled in fours; keels and lateral
nerves of lemma ciliate; wool scanty; leaves up to
5 mm broad; panicle green
34. Panicle-branches in pairs; keel and lateral nerves of
lemmas densely ciliate; wool copious; leaves up to

- 4 mm broad; panicle silvery *P. nepalensis*
33. Keels of palea scabrid throughout:—
35. Stems and sheaths compressed; side nerves of lemma obscure; spikelets rather crowded in the panicle
P. compressa
35. Stems and sheaths terete:—
36. Lower sheaths scabrid:—
37. Ligule long, pointed, more than 1.5 mm long; panicle-branches in distinct whorls of 4–6 (usually 5); side nerves of lemma prominent; inflorescence spreading; plant erect from the base
P. trivialis
37. Ligule short, just over 1 mm long; panicle-branches in twos or alternate; lemmatal nerves obscure; panicle compact; base curved
P. alpigena
36. Lower sheaths smooth:—
38. Lemmas very broad, rounded on back and hyaline at the tips, or compressed:—
39. Lemmas strongly compressed, up to 3.75 mm long; palea scabrid with many teeth; a dwarf plant not more than 4 cm tall; panicle globose, compact; spikelets dark purple *P. phariana*
39. Lemmas rounded on the back; palea with distant teeth on the keels; up to 10 cm tall, with long reflexed panicle-branches; spikelets suffused gold and purple or green
P. calliopsis
38. Lemmas not broad, acute or narrowly obtuse at the tip:—
40. Lowest branches of the panicle 3–5-nate; grasses with shortly or extensively creeping rhizomes or short or long stolons:—
41. Perennials, loosely or densely tufted, with short stolons; ligules acute or obtuse; side nerves of the lemmas obscure or prominent:—
42. Ligules pointed, 3–4 mm long; side nerves of the lemmas very prominent; lemmas green:—
43. Stems and basal sheaths scabrid
P. trivialis var. *trivialis*
43. Stems and basal sheaths smooth
P. trivialis var. *glabra*
42. Ligules rounded, 3 mm long; side nerves of the lemmas very obscure; lemmas with

- a brown or copper streak below the hyaline tip
41. Perennials with widely creeping *P. palustris* forming scattered vegetative shoots or culms or tufts of these; ligules truncate; side nerves of the lemmas very conspicuous;—
44. Plants erect from the base:—
45. Basal leaves narrow, almost setaceous; lemmas 2.5–3 mm long *P. angustifolia*
45. Basal leaves broad, flat; lemmas 3–4.5 mm long:—
46. Ligules not more than 2 mm long; lemmas 3–3.5 mm long *P. pratensis*
46. Ligules 2.5–6 mm long; lemmas 3.5–4.5 mm long *P. jaunsarensis*
44. Plants conspicuously curved at the base *P. alpigena*
40. Lowest branches of the panicle 2-nate, occasionally 3-nate; plants non-rhizomatous or with a thick horizontal or inclined rootstock (*P. araratica*):—
47. Lower glume equal to or longer than the lowest lemma:—
48. Panicle spreading; glumes acute, not acuminate or subulate:—
Lemmas 2.25–2.5 mm long *P. rhadina*
Lemmas 5–6 mm long *P. eleanorae*
48. Panicle very narrow, linear-oblong with ascending branches; glumes subulate in profile *P. setulosa*
47. Lower glume definitely shorter than the lowest lemma:—
49. Panicle narrow:—
50. Plants very glaucous *P. litwinowiana*
50. Plants not at all glaucous:—
51. Branches not more than 2 cm long; spikelets elliptic or lanceolate, usually suffused with violet; base of plant reddish-mauve; root-stock rhizomatous, stout *P. araratica*
51. Branches over 3 cm long; spikelets wedge-shaped, green or yellowish-green; lemmas broadly hyaline on the margins; plants green or pale at the base; no stout rootstock *P. sterilis*

49. Panicle spreading:—
52. Lemmas quite glabrous, broadly hyaline on the margins *P. aitchisonii*
52. Lemmas at least ciliate on the keel and nerves, narrowly or broadly hyaline on margins and at the tip:—
53. Lower glume reaching half-way up the lowest lemma or less; lemmas 4-4.5 mm long; lowest branches of panicle 2-nate *P. himalayana*
53. Lower glume longer than half the lowest lemma; lemmas 3-4 mm long:—
54. Lemmatal nerves conspicuous; lower glume very narrow, 1-nerved; spikelets green; lowest branches of the panicle 3-5-nate *P. khasiana*
54. Lemmatal nerves faint; lower glume lanceolate or elliptic, 3-nerved; spikelets yellowish-green; lowest branches of the panicle 2-nate *P. sterilis*
29. No wool on the callus:—
55. Ligules less than 1 mm long *P. khasiana*
55. Ligules over 1 mm long:—
56. Keels of the palea ciliate below, scabrid above:—
57. Panicle over 20 cm long, 15-20 cm wide; lemmas over 3.5 mm long *P. imperialis*
57. Panicle up to 15 cm long; lemmas mostly below 3 mm long *P. sikkimensis*
56. Keels of the palea either ciliate or scabrid throughout:—
58. Keels ciliate:—
59. Intermediate nerves of lemma glabrous; anthers 1.2-1.6 mm long *P. supina*
59. All nerves of the lemma hairy; anthers less than 1 mm long:—
60. Anthers 0.2-0.3 mm long; upper floret markedly dissimilar to the lower *P. infirma*
60. Anthers 0.6-0.8 mm long; upper floret similar to the others *P. annua*
58. Keels of palea scabrid:—
61. Culms scabrid below the panicle:—
62. Lemmatal nerves conspicuous; lemmas scabrid; anthers less than 1 mm long *P. wardiana*
62. Lemmatal nerves obscure; lemmas smooth; anthers over 1.5 mm long:—

63. Spikelets wedge-shaped, 5–6 mm long, 4-several-flowered; panicle widely spreading; lemma broadly hyaline at the tip, narrowly so on the margins, obtuse, sparsely pubescent on the nerves; a yellowish band present below the hyaline tip; panicle lax; culms 30–60 cm tall; plants green
P. sterilis
63. Spikelets elliptic or lanceolate, 2–3(4)-flowered, 4–5 mm long; panicle of closely crowded spikelets; lemmas not broadly hyaline, usually acute, markedly pubescent on the nerves, no yellowish band below the tip; plants very glaucous, up to 30 cm tall
P. litwinowiana
61. Culms smooth below the panicle:—
64. Culms strongly compressed
P. compressa
64. Culms terete:—
65. Glumes usually equal to or longer than lowest lemma; if shorter, then base covered with long scarious sheaths; panicle strict, shortly exerted
P. pseudamoena
65. Glumes definitely shorter than lowest lemma; basal sheaths not long and scarious; panicle usually long-exserted:—
66. Lemma quite glabrous on dorsal surface; inflorescence a narrow, linear panicle
P. poophagorum
66. Lemmas with at least keel and side nerves ciliate:—
67. Inflorescence a spreading panicle:—
68. Spikelets up to 6 mm long; lemmas 3.5–3.75 mm long; anthers 2–2.5 mm long
P. aitchisonii
68. Spikelets up to 3.25 mm long; lemmas 2–2.5 mm long; anthers 0.4–0.5 mm long
P. tibetica
67. Inflorescence a strict panicle
P. poophagorum
1. *Poa afghanica* Bor in Kew Bull. 1954, 501 (1955).
Known from the type collection only. It is somewhat similar to *P. pratensis* Linn. in appearance but the stamens are longer and there is much less wool.
Exsicc.—Edelberg 0851, Afghanistan (close to the Pakistan boundary).
2. *Poa aitchisonii* Boiss., Fl. Orient. 5, 602 (1884).
Distribution: Northwest India, Afghanistan.

47. ***Poa stewartiana*** Bor in Kew Bull. 1951, 185 (1951).
 Distribution: Northwestern Himalaya. A fairly common species in the hills above 2000 m.
 Exsicc.—R. R. Stewart 8675, Kashmir; J. F. Duthie 19777, Jaunsar; J. R. Drummond 21362, Punjab.
48. ***Poa supina*** Schrad., Fl. Germ. 1, 289 (1806).
 Distribution: From Western Europe to the Himalaya and Russia.
 The Indian specimens are exactly like those collected in Western Europe. $2n = 14$ (Nannfeldt, 1935).
 Exsicc.—J. F. Duthie 11599, Hazara; J. R. Drummond 23354, Lahul.
49. ***Poa tibetica*** Munro ex Stapf in Hook. f., Fl. Brit. Ind. 7, 339 (1896).
P. tianshanica (Regel) Hack. in Fedtsch., Fl. Pam., 209 (1903).
P. tibetica var. *aristulata* Hook. f., Fl. Brit. Ind. 7, 339 (1896).
 Distribution: Lahul, Tibet, Russia, above 3500 m.
 A fine species which forms part of the grazing in alpine pastures. The var. *aristulata* Hook. f. is possibly a diseased form and not worth maintaining as a variety. $2n = 42$.
 Exsicc.—N. L. Bor 16913, Lahul; T. Thoms. s.n., Tibet.
50. ***Poa tibeticola*** Bor in Kew Bull. 1948, 139 (1948).
 Distribution: Sikkim and Tibet, between 3000 and 5000 m.
 Exsicc.—Rohmoo Lepcha 284, Sikkim; Younghusband 304, Tibet.
51. ***Poa trivialis*** Linn., Sp. Pl. ed. 1, 67 (1753).
 Distribution: Widespread in the Northern Hemisphere, introduced in the temperate highlands of Africa and South America.
 It is an excellent grass fodder and is also suitable for making into hay.
 $2n = 14, 27, 28$.
 var. ***trivialis***.
 Exsicc.—N. L. Bor 13197, Lahul; J. S. Gamble 12095, Madras.
 var. ***glabra*** Doell, Rhein. Fl. 92 (1843).
 Exsicc.—Aitchison 295, 308, Afghanistan.
52. ***Poa wardiana*** Bor in Kew Bull. 1948, 143 (1948).
 Distribution: Assam, Balipara Frontier Tract at 3000–4000 m.
 A shade grass growing in the *Abies-Rhododendron* complex.
 Exsicc.—F. Kingdon-Ward 13990, northeast Assam.

Psilurus Trin., Fund. Agrost. 93 (1820).

1. ***Psilurus incurvus*** (Gouan) Schinz et Thell. in Vierteljschrift. Naturf. Ges. Zürich 58, 40 (1913).
Nardus incurva Gouan, Hort. Monspel. 33 (1762).
N. aristatus Linn., Sp. Pl. ed. 2, 1, 78 (1762).
Psilurus rottboellioides Griff., Notulae 3, 95 (1851).

Ps. aristatus (Linn.) Duval-Jouve in Bull. Soc. Bot. France **13**, 132 (1866).
Ps. nardoides Trin., Fund. Agrost. 93 (1820).

Distribution: Mediterranean Region through Iran, Iraq, Afghanistan to Swat.

A very slender annual.

Exsicc.—*Griffith* s.n., Afghanistan; *S. Ali* s.n., Swat.

***Puccinellia* Parl., Fl. Ital. 1, 366 (1848).**

This name has been conserved (see Kew Bull. 1940, 91 (1940)) against *Atropis* Rupr.—the latter first appears as a nomen provisorium in Beitr. Pflanz. Russ. Reich. 2, 64 (1845).

Key to the species of *Puccinellia*

1. Dwarf species; lemmas not more than 2.5 mm long; plant about 5 cm tall
P. minuta
1. Robust species, up to 45 cm tall; lemmas 2.75–5 mm long:—
 2. Tips of the lemmas acute; lemmas quite glabrous:—
 3. Lemmas 4.5–5 mm long by 1.5 mm wide; anthers 2.75–3 mm long
P. thomsonii
 3. Lemmas 2.75–3 mm long by 2 mm wide; anthers 0.6–0.8 mm long
P. kashmiriana
 2. Tips of the lemmas obtuse; lemmas hairy or glabrous:—
 4. Lemmas 3.5–4 mm long by 2 mm broad, quite glabrous; anthers 2 mm long
P. stapfiana
 4. Lemmas 1.5–3 mm long; anthers 0.5–1.5 mm long:—
 5. Axis and branches very rough; lemmas sparsely hairy below
P. distans
 5. Axis and branches smooth; lemmas quite glabrous
P. himalaica

1. ***Puccinellia distans* (Linn.) Parl., Fl. Ital. 1, 367 (1848).**

Poa distans Linn., Mant. 32 (1767).

Glyceria distans (Linn.) Wahlb., Fl. Upsal. 36 (1820).

Atropis distans (Linn.) Griseb. in Ledeb., Fl. Ross. 4, 388 (1853).

Distribution: Europe, North America, northwest Africa and the temperate parts, including the hills, of Asia.

Exsicc.—*T. Thoms.* s.n., Lassen.

2. ***Puccinellia himalaica* Tzvel. in Not. Syst. 17, 66 (1955).**

Distribution: Kashmir (Rupshu) and South Russia.

Grows in wet, sometimes alkaline, sand.

Exsicc.—*W. Koelz* 2216, Kashmir; *T. Thoms.* s.n., Tibet Occ.

3. ***Puccinellia kashmiriana* Bor in Kew Bull. 1953, 270 (1953).**

Distribution: Kashmir (Kamri Valley) and Lahul at an altitude of about 5000 m.

Grows gregariously in purplish patches.

Exsicc.—*J. F. Duthie* 12543, Kashmir; *N. L. Bor* 16360, Lahul.

4. ***Puccinellia minuta*** *Bor ex Per Wendelbo* in *Nytt Mag. Bot.* 1, 19 (1952).

Distribution: Chitral at an altitude of about 4500 m on moraines close to the South Barum glacier.

A very delicate species.

Exsicc.—*Per Wendelbo* s.n., Chitral.

5. ***Puccinellia stapfiana*** *R. R. Stewart* in *Brittonia* 5, 418 (1945).
Glyceria poaeoides *Stapf* in *Hook. f., Fl. Brit. Ind.* 7, 348 (1896): non
Puccinellia poaeoides *Keng* in *J. Wash. Acad. Sci.* 28, 301 (1938).

Distribution: Kashmir and plains of Tibet.

This plant grows in wet sand on the borders of a salt lake near Rupshu and in the neighbouring grassy plains.

Exsicc.—*T. Thoms.* s.n., Rupshu.

6. ***Puccinellia thomsonii*** (*Stapf*) *Stewart* in *Brittonia* 5, 418 (1945).

Glyceria thomsonii *Stapf* in *Hook. f., Fl. Brit. Ind.* 7, 347 (1896).

Atropis thomsonii *Pamp.*, *Fl. Cara.* 77 (1930).

Distribution: Kashmir and plains of Tibet.

Collected by *Koelz* in Rupshu near a mineral spring in alkali impregnated soil.

Exsicc.—*W. Koelz* 2176, Kashmir; *T. Thoms.* s.n., Puga, Rupshu.

Sclerochloa *P. Beauv.*, *Ess. Agrost.* 97 (1812), t. 19, f. 4.

1. ***Sclerochloa dura*** (*Linn.*) *P. Beauv.*, *Ess. Agrost.* 98 (1812), t. 19, f. 4.

Cynosurus durus *Linn.*, *Sp. Pl. ed.* 1, 72 (1753).

Poa dura (*Linn.*) *Scop.*, *Fl. Carn.* 1, 70 (1772).

Sesleria dura (*Linn.*) *Kunth*, *Rév. Gram.* 1, 110 (1829).

Eleusine dura (*Linn.*) *Lamk.*, *Tab. Encycl. Meth. Bot.* 1, 203 (1791).

Festuca dura (*Linn.*) *Vill.*, *Hist. Pl. Dauph.* 2, 94 (1787).

Distribution: Europe and the Orient to northwest India.

Exsicc.—*R. R. Stewart* 12031, Kashmir; *T. Thoms.* s.n., Kashmir.

Vulpia *C. C. Gmel.*, *Fl. Bad.* 1, 8 (1806).

Key to the species of *Vulpia*

1. Inflorescence not at all bristly (*V. megalura* has a few long hairs on the margins of the lemmas):—

2. Lower glume 2.5–5 mm long; lemmas glabrous:—

3. Lemmas not at all hyaline; spikelets more than 5-flowered

V. octoflora

3. Lemmas hyaline on the margins; spikelets less than 5-flowered

2. Lower glume at most 1.5 mm long; lemmas furnished with long hairs on the margins

1. Inflorescence very bristly; lemmas covered all over the dorsal surface with stiff, shortish hairs

1. **Vulpia ciliata** Link, Hort. Berol. 1, 147 (1827).

Distribution: Persia, Baluchistan.

Exsicc.—J. J. Norris 45, Quetta.

2. **Vulpia megalura** (Nutt.) Rydb. in Bull. Torr. Bot. Club 36, 538 (1909).

Festuca megalura Nutt., J. Acad. Phila. 2, 1, 188 (1848).

F. commutata Steud., Syn. Pl. Glum. 1, 304 (1854).

Distribution: A North American grass introduced into the Old World, including India and Australia.

Exsicc.—Wingate s.n., Saharanpur; Narayanaswami 4325, Ootacamund.

3. **Vulpia myuros** (Linn.) Gmel., Fl. Bad. 1, 8 (1806).

Festuca myuros Linn., Sp. Pl. 74 (1753).

Avena muralis Salisb., Prod. Stirp. 22 (1796).

Festuca muralis Kunth, Syn. Pl. 1, 218 (1822).

Vulpia muralis (Kunth) Nees in Linnaea 19, 694 (1847).

Zerna myuros Panz. ex Jacks., Ind. Kew. 2, 1249 (1895).

Vulpia muralis (Kunth) Henr. in Blumea 2, 319 (1937).

Distribution: Europe generally, penetrating into the temperate parts of Asia.

This species is usually found as a weed in cultivation. $2n = 14$.

Exsicc.—N. L. Bor 14084, Manali, Kulu; G. A. Gammie s.n., Simla; J. H. Lace 3319, Baluchistan; J. S. Gamble 21403, Madras.

4. **Vulpia octoflora** (Walt.) Rydb. in Bull. Torr. Bot. Club 36, 538 (1909).

Festuca octoflora Walt., Fl. Car. 81 (1788).

F. tenella Willd., Sp. Pl. 1, 419 (1798).

Distribution: United States—a casual in the Old World.

Exsicc.—Wingate s.n., northwest India (probably at Saharanpur).

POOIDEAE—GARNOTIEAE**GARNOTIEAE** *Tateoka* in J. Jap. Bot. 32, 277 (1957)

Spikelets strictly 1-flowered, lanceolate, cylindrical or ellipsoid in shape, falling entire from the pedicels; rhachilla not produced beyond the solitary floret. Glumes as long as the spikelet, strongly 3-nerved, bearded or not at the base, beaked, acute or rarely awned; lemmas membranous or hyaline, 3-5-nerved, entire or bifid at the tip, if the latter then an awn issuing from between the lobes which are rarely awned; palea 2-nerved, narrow, hyaline. Lodicules 2, ovate-lanceolate or cuneate. Stamens 3. Ovary glabrous at the top; styles 2; stigmas plumose. Grain narrow, free between lemma and palea; hilum basal, oblong or punctiform; embryo about one-third the length of the grain.

Erect, perennial, rarely annual, grasses, with narrow, acuminate or acute leaves; silica-cells variable, sometimes saddle-shaped or dumb-bell-shaped; micro-hairs 2-celled, thread-like; ligules a ciliate rim or a narrow ciliate membrane. Spikelets borne in panicles, falling entire from the pedicels.

Chromosomes small; basic number 10.

Genera : *Cyathopus*

Garnotia

Key to the genera of **Garnotieae**

1. Lemma long awned from the sinus of the bifid tip; lobes awned or not
Garnotia
1. Lemma entire at the tip, awnless
Cyathopus

Cyathopus Stapf in Hook., Ic. Pl. (1895), t. 2395.

1. **Cyathopus sikkimensis** Stapf in Hook., Ic. Pl. sub tab. 2395 (1895).
Distribution: Endemic in Sikkim.

Exsicc.—Hook. f. s.n., Lachoong, 3600 m, Sikkim—in woods.

This grass has only been collected on two occasions separated by 100 years. The second collection, by my collector in Sikkim, was in fruit and opportunity is taken to describe the grain. In shape the grain is obovate-elliptic, 2 mm long; the embryo is about one-third the length of the grain and the hilum is basal, punctiform.

Garnotia Brongn. in Duperr., Voy. Coq. Bot.
132 (1832), t. 21.

Berghausia Endl., Gen., Suppl. 3, 57 (1843).

Miquelia Arn. et Nees in Nov. Act. Nat. Cur. 19,
Suppl. 1, 177 (1843).

Key to the species of *Garnotia*

1. Blades not articulated on the sheath, long, stiff, erect, triangular in section or at least with a very thick keel, or flat; sheaths all collected at

- the base of the stem, equitant; margins of sheaths woolly, at length glabrate; very robust grasses:—
2. Spikelets awnless or with a very short awn; leaves flat *G. mutica*
 2. Spikelets awned; leaves complicate:—
 3. Awn without a proper twisted column, deflexed from the apex of the lemma *G. scoparia*
 3. Awn perfect, i.e. with a twisted column and geniculate bristle:— *G. schmidtii*
 4. Spikelets 5–6 mm long; branches of the panicle up to 7 cm long; panicle congested up to 25 cm long *G. elata*
 4. Spikelets 4–4.5 mm long; branches of the panicle up to 5 cm long; panicle not congested, up to 60 cm long
 1. Blades articulated on the sheaths, flat and flaccid; sheaths distributed along the culm; slender, low or semi-robust grasses:—
 5. All spikelets muticous, not awned:—
 6. Spikelets 2.75 mm long; glumes and lemma smooth and glabrous with green nerves; branches of the panicle smooth; tip of glumes obtuse; spikelets sessile or shortly pedicelled *G. panicoides*
 6. Spikelets 2.25–2.5 mm long; glumes acute, scabrid on the nerves and dorsal surface; nerves not green; branches of the panicle scabrid; pedicels over 2 mm long *G. micrantha* var. *nana*
 5. Some spikelets awned, others awnless *G. micrantha* var. *micrantha*
 5. All spikelets awned:—
 7. Awn long, 20 mm long or more:—
 8. Lemma bifid at the tip; small delicate species growing in moss on the branches of trees or on roofs; branches of the panicle horizontal or deflexed; partly cleistogamous *G. arborum*
 8. Lemma with two setae at the tip; not growing in moss on trees or on roofs; branches of the panicle ascending; plant not cleistogamous *G. emodi*
 7. Awns much shorter:—
 9. Leaves collected at the decumbent base of the plant, 2–4 cm long, 4 mm wide; spikelets 5 mm long; awn 10 mm long *G. fuscata*
 9. Leaves arranged all along the stem:—
 10. Leaves up to 25 cm long by 2.5 cm broad, rounded or subcordate at the base, broadly lanceolate, ending in a filiform tip *G. arundinacea*
 10. Leaves very much narrower, narrowed at the base:—
 11. Leaves linear with a dense row of hairs behind the ligule; collar densely hairy; awn erect, sometimes weakly twisted at the base and deflexed; both glumes awned (2 mm) *G. fergusonii*
 11. Leaves with a short membranous ligule, without a dense row of hairs behind; racemes fascicled along the rhachis:—
 12. Panicle contracted; racemes in each fascicle numerous, ascending *G. stricta*

12. Panicle lax; racemes in each fascicle few, spreading
G. courtallensis

- ✓ 1. **Garnotia arborum** Stapf ex Woodrow in J. Bomb. Nat. Hist. Soc. 13, 439 (1901) nomen; descr. in Cooke, Fl. Bomb. 2, 1013 (1908).
 Distribution: Madras, Bombay.

A very strange species found growing in moss on the trunks of trees and on moss-covered rocks. The spikelets are few in number and are caducous. Cleistogamous spikelets are found in the sheaths.

Exsicc.—Meebold 10771, Castle Rock; Woodrow s.n., Lonavli, Western Ghats.

2. **Garnotia arundinacea** Hook. f., Fl. Brit. Ind. 7, 243 (1896).
 Distribution: Nilgiris, Madras, endemic.

Said to be very common on the western slopes. It is a weak, trailing grass growing in shady places.

Exsicc.—Bourne 92, Madras; C. B. Clarke 11015, Nilgiris.

3. **Garnotia courtallensis** (Arn. et Nees) Thw., Enum. Pl. Zeyl. 363 (1864).

Miquelia courtallensis Arn. et Nees in Nov. Act. Nat. Cur. 19, Suppl. 1, 179 (1843).

Berghausia courtallensis Endl. ex Miq. in Verh. Konink. Nederl. Inst. 3, 4, 32 (1851).

Distribution: Madras and Ceylon at the highest elevations.

This species is found in woods and shady nullahs.

Exsicc.—Bourne 1957, Madras; Herb. Wight. 2346, Madras; F. Ballard 1253, Ceylon.

4. **Garnotia elata** (Arn. ex Miq.) Janowsky in Fedde, Rep. Sp. Nov. 17, 86 (1921).

Berghausia elata Arn. ex Miq. in Verh. Konink. Nederl. Inst. 3, 4, 32 (1851).

Miquelia elata Arn. et Nees in Wight Cat. 2600, nomen.

Garnotia tenuiglumis Stapf ex Hook. f., Fl. Brit. Ind. 7, 242 (1896).

Distribution: Madras, endemic.

This species is very close to *G. scoparia* and is included in it by C. E. C. Fischer in Gamble, Fl. Madras 1812 (1934).

Exsicc.—Herb. Wight. 3247, Madras.

5. **Garnotia emodi** (Arn. et Nees) Janowsky in Fedde, Rep. Sp. Nov. 17, 86 (1921).

Miquelia emodi Arn. et Nees in Nov. Act. Nat. Cur. 19, Suppl. 1, 178 (1843).

Garnotia polypogonoides Munro ex Oliver in Hook., Ic. Pl. (1885), t. 1481.

Berghausia emodi Endl. ex Miq. in Verh. Konink. Nederl. Inst. 3, 4, 32 (1851).

Distribution: Temperate Himalaya from Garhwal to Sikkim.
Exsicc.—*Wallich* 8884, Nepal; *Hook. f.* s.n., Sikkim.

6. ***Garnotia fergusonii* Trim.** in J. Bot. 27, 170 (1889).

Distribution: Ceylon, endemic.

I have not seen the variety, var. *fastigiata* Hook. f. [in *Trim.*, Fl. Ceyl. 5, 256 (1900)]. It differs from the type in its fastigate branching and Senaratna considers it worthy of being maintained.

Exsicc.—*Thwaites* C.P. 3967, Ceylon.

7. ***Garnotia fuscata* Thw.**, Enum. Pl. Zeyl. 363 (1864).

Distribution: Ceylon, endemic.

A rare species found on Adam's Peak.

Exsicc.—*Thwaites* C.P. 2756, Ceylon.

8. ***Garnotia micrantha* Thw.**, Enum. Pl. Zeyl. 363 (1864).

Distribution: Ceylon.

var. *micrantha*.

Exsicc.—*Thwaites* C.P. 945, Ceylon.

var. *nana* Stapf ex Hook. f., Fl. Brit. Ind. 7, 244 (1896).

Distribution: Ceylon.

Exsicc.—*Thwaites* C.P. 944, Ceylon.

9. ***Garnotia mutica* (Munro) Druce** in Rep. Bot. Soc. Exch. Club 624 (1916).

Berghausia mutica Munro in Proc. Amer. Acad. 4, 362 (1864).

Garnotia tectorum Hook. f., Fl. Brit. Ind. 7, 242 (1896).

Distribution: Madras, Burma and Ceylon.

Exsicc.—*Meebold* 13528, Travancore; *Gardener* 1600, Ceylon; *J. H. Lacc* 6309, Ruby Mines, Burma.

10. ***Garnotia panicoides* Trim.** in J. Bot. 27, 170 (1889).

Distribution: Ceylon, endemic.

There is only a fragment of this interesting species at Kew. The type is at Peradeniya and is the only gathering cited by Senaratna.

Exsicc.—*Ferguson* s.n., Kalutara, Ceylon.

11. ***Garnotia schmidii* Hook. f.**, Fl. Brit. Ind. 7, 242 (1896).

Distribution: Madras, endemic.

A perennial with flattened distichous leaf-sheaths.

Exsicc.—*Schmidt* s.n., Nilgiris (type K).

12. ***Garnotia scoparia* Thw.**, Enum. Pl. Zeyl. 363 (1864).

Berghausia scoparia Munro ex Thw., loc. cit. nomen nudum.

Garnotia thwaitesii Stapf ex Hook. f., Fl. Brit. Ind. 7, 241 (1896).

Distribution: Madras and Ceylon.

A very stout, tufted perennial. According to Senaratna it grows sometimes on rocks. $2n = 20$.

Exsicc.—*Thwaites* C.P. 943 (type K); *G. Thoms.* s.n., Nilgiris; *Wallich* 8912, Madras.

- ✓ 13. *Garnotia stricta* Brongn. in Duperr., Voy. Coq. Bot. 133 (1831), t. 21.
Berghausia tenella W. Arn. ex Miq. in Verh. Konink. Nederl. Inst. 3, 4, 34 (1851).
B. pallens W. Arn. ex Miq. loc. cit. 33.

Distribution: Widely distributed in Southeast Asia.

Grows gregariously in shady places on the hills in areas of high rainfall.

It is grazed by cattle.

Exsicc.—Meebold 10582, Madras; Hook. f. et T. Thoms. s.n., Khasia; J. S. Gamble 9923, Sikkim.

This is a polymorphic species and *Garnotia puchiparensis* described by the writer in *Indian Forest Records*, n.s., Bot. 2, 234 (1941) probably should be included in it.

The revision of the genus *Garnotia* by Santos (1950) is remarkable for the large number of new species, forms and varieties recognized by that author. As he himself admits, the distinctions he draws between species are extremely fine, and indeed, these are so fine that they are regarded by the orthodox taxonomist as varietal rather than specific. A small portion only, a mere fifty specimens, of the large number of sheets of this genus at Kew, was borrowed by Dr. Santos for this revision. Of these fifty specimens no less than thirty-one became the types of new taxa. Most of these were formerly included in the polymorphic species *Garnotia stricta* Brongn. Until we know more about this genus a more orthodox treatment than that advocated by Dr. Santos seems to be advisable.

POOIDEAE—GLYCERIEAE

GLYCERIEAE Endl., Fl. Poson. 117 (1830) as *Glycerinae*

Spikelets few- to many-flowered, subterete or slightly compressed; rachilla disarticulating above the glumes and between the florets. Glumes persistent, unequal, 1-nerved, hyaline, usually scarious; lemmas obtuse, membranous, rounded on the back, 7-9-nerved, hyaline at the tip; nerves prominent; palea as long as the lemma or shorter, hyaline, 2-keeled, smooth or scaberulous on the keels. Lodicules 2, minute. Stamens 3; anthers large or small. Ovary glabrous; styles 2, short, distinct; stigmas plumose. Lodicules connate, fleshy, swollen. Caryopsis long, slender; hilum linear, as long as the caryopsis; embryo small; starch-grains compound.

Perennial or annual, usually aquatic herbs. Leaf-blades usually narrow, linear, with festucoid anatomy and transverse nervules; silica-cells with wavy outlines; micro-hairs 1-celled; ligules membranous or scarious. Margins of the leaf-sheaths fused. Spikelets arranged in effuse panicles or racemes.

Chromosomes small; basic number 4 or 5.

Genus: Glyceria

Glyceria R.Br., Prodr. Fl. Nov. Holl. 179 (1810).

Atropis Rupr., Fl. Samoj. 61 (1845).

Devauxia P. Beauv. ex Kunth, Enum. Pl. 1, 367 (1833) in syn.

Diachroa Nutt. ex Steud. Nom. ed. 2, 1, 497 (1840).

Exydra Endl., Fl. Poson. 119 (1830).

Hydrochloa Hartm., Gram. Skand. 8 (1819).

Porroteranthe Steud., Syn. Pl. Glum. 1, 287 (1854).

Key to the species of *Glyceria*

1. Ligules over 2 mm long; lemmas 3.5-5 mm long:—
 2. Lemmas with a broad hyaline silvery band at the rounded tip, extending half-way down the sides *G. plicata*
 2. Lemmas without a broad silvery band at the top with nerves penetrating almost to the upper margin; tip not rounded *G. spicata*
1. Ligules less than 2 mm, often less than 1 mm long; lemmas very definitely 7-nerved, scabrid on the nerves and often scabrid on the intercostal spaces *G. tonglensis*

1. *Glyceria plicata* Fries, Nova Mantissa 3, 176 (1842).

Distribution: Europe, Western Asia and North Africa.

According to Hubbard: "As in other species of *Glyceria*, its luscious

POOIDEAE—HUBBARDIEAE**HUBBARDIEAE C. E. Hubbard***

Spikelets all alike, 2-flowered, terete; the lower floret empty, the upper hermaphrodite; rhachilla disarticulating between the upper glume and the lower lemma. Glumes as long as the spikelet, thinly membranous, persistent, 5–7-nerved. Lower lemma as long as the spikelet, finely 7–9-nerved, empty, without a palea; upper lemma similar containing a hermaphrodite flower, without a palea. Lodicules 2, cuneate, glabrous. Stamens 3. Caryopsis fusiform, free between the two lemmas; hilum short, linear, basal; embryo about one-third the length of the grain; starch-grains compound.

The single genus and species, endemic to South India, is a very delicate branching annual growing in drenched soil or moss in an atmosphere of heavy mist; leaf-blades narrowly elliptic, exceedingly thin; silica-cells quadrate. Two-celled hairs absent. Ligule absent. Chromosome number not known.

Genus: Hubbardia

Hubbardia Bor in Kew Bull. 1950, 385 (1951).

✓ 1. **Hubbardia heptaneuron** Bor in Kew Bull. 1950, 385 (1951).

Distribution: This striking species has been collected on two occasions only and in the same place, namely, on rocks constantly moistened by spray in the vicinity of the famous Gersoppa Falls on the Sharavati river, which forms the boundary between the States of Bombay and Mysore.

The extreme thinness of the leaves and peculiar mode of life merit study. Moreover its taxonomic position has not yet been satisfactorily determined and further fresh material may enable this question to be decided. Pilger in *Bot. Jahr.* 76, 3, 317 (1954) placed this genus tentatively in the *Aveneae*.

Exsicc.—L. J. Sedgwick 7089, Bombay (type K).

*See page 685

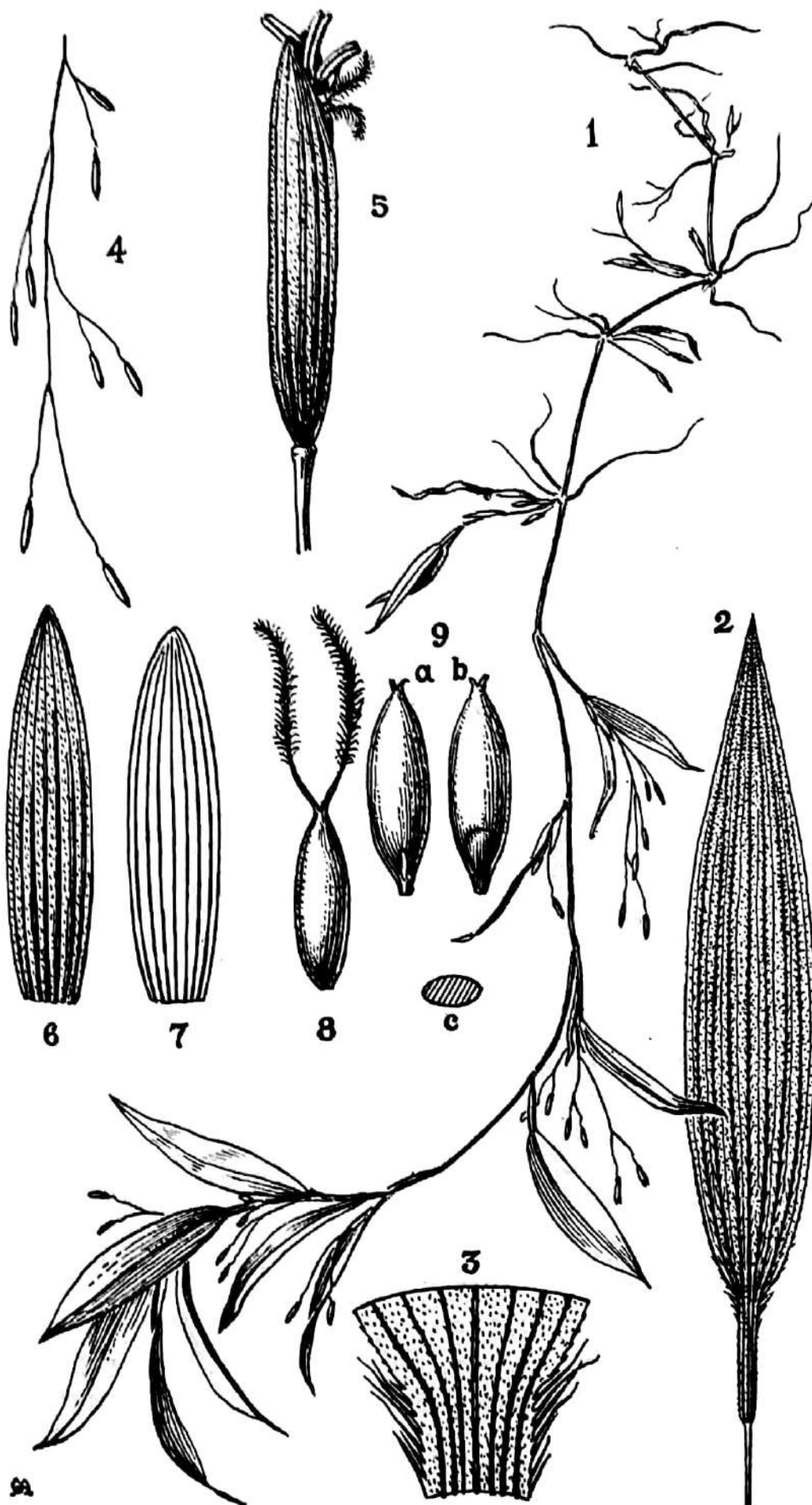


Fig. 60. *Hubbardia heptaneuron* Bor
 1, plant $\times 1$; 2, leaf $\times 3$; 3, collar $\times 12$; 4, raceme $\times 2$; 5, spikelet $\times 20$;
 6, glume $\times 20$; 7, lemma $\times 20$; 8, ovary $\times 20$; 9, caryopsis, (a) adaxial view,
 (b) abaxial view, (c) transverse section, $\times 20$.

POOIDEAE—ISACHNEAE

ISACHNEAE *Benth.* in J. Linn. Soc. (Bot.) 19, 30, 92 (1881) *pro parte*

Spikelets alike, hermaphrodite, 1-, 2-, very rarely 3-flowered, small to very small, awnless; rhachilla disarticulating above the glumes and usually between the florets, not produced. Glumes persistent, eventually deciduous, usually equal, membranous, 3-9-nerved, rarely nerveless, shorter than or rarely slightly longer than the spikelet; lemma membranous or chartaceous, 5-7-nerved; palea as long as the lemma or absent; upper lemma similar to the lower or often smaller, firmer or of the same texture, 5-7-nerved. Lodicules 2, cuneate, truncate. Stamens 2 or 3. Caryopsis free between the lemma and palea, fusiform, ovoid or ellipsoid, plano-convex or elliptic in section; hilum small and basal, or linear and elongated; embryo up to one-third the length of the caryopsis; starch-grains simple.

Annual or perennial grasses. Leaf-blades usually broad, with festucoid anatomy; silica-cells dumb-bell-shaped, cross-shaped or roughly rectangular with concave sides; micro-hairs simple or 2- or more-celled; ligules a row of hairs or absent. First foliage-leaf of the seedling vertical. Inflorescence of panicles or spike-like panicles or spike-like racemes.

Chromosomes small; basic number 10.

Genera: *Coelachne*

Limnopoia

Isachne

Sphaerocaryum

Key to the genera of *Isachneae*

1. Spikelets usually 2-flowered:—
 2. Upper lemma becoming indurated; glumes finally deciduous:—
 3. Spikelets pedicelled in open or contracted panicles *Isachne*
 3. Spikelets borne on the more or less flattened rhachis of secund spike-like racemes *Limnopoia*
 2. Upper lemma remaining membranous; glumes persistent *Coelachne*
1. Spikelets 1-flowered, borne in small panicles; glumes separately deciduous *Sphaerocaryum*

Coelachne *R.Br.*, Prodr. Fl. Nov. Holl. 187 (1810).

Key to the species of *Coelachne*

1. Glumes ovate-oblong, 1.25-2 mm long; lower lemma 2.5-2.75 mm long; panicles open, with spreading branches; callus of upper lemma villous *C. perpusilla*
1. Glumes subrotund, 1-1.5 mm long; lowest lemma 1.2-2.25 mm long; panicles spiciform, with short usually ascending branches; callus of upper lemma glabrous *C. simpliciuscula*

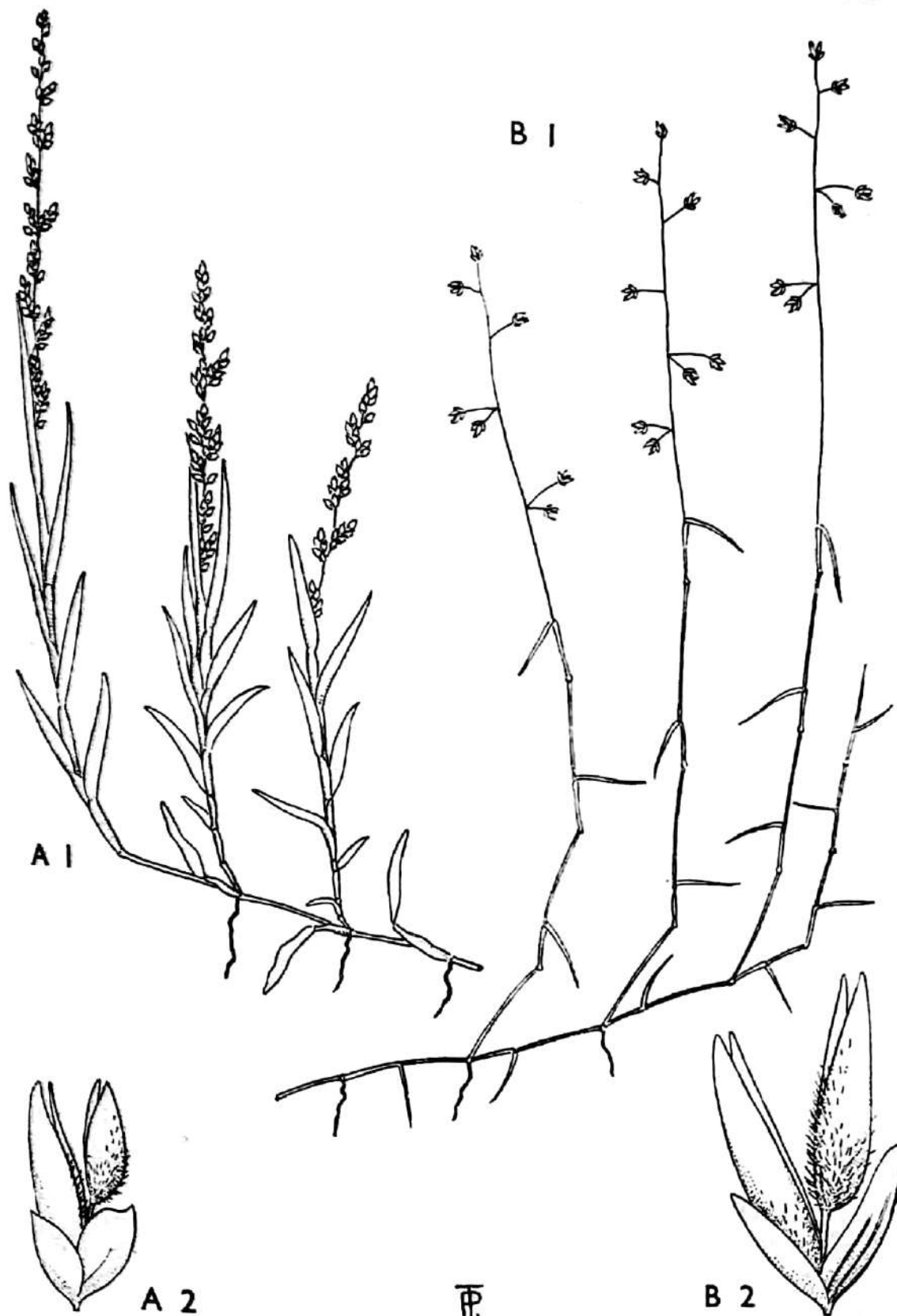


Fig. 61

A. *Coelachne simpliciuscula* (Wt. et Arn.) Munro ex Benth.
1, Habit $\times 1$; 2, spikelet $\times 10$.

B. *C. perpusilla* (Arn. ex Steud.) Thw.
1, Habit $\times 1$; 2, spikelet $\times 10$.

- ✓ 1. **Coelachne perpusilla** (Arn. ex Steud.) Thw., Enum. Pl. Zeyl., 373 (1864).
Panicum perpusillum Arn. ex Steud., Syn. Pl. Glum. 1, 96 (1854).
Coelachne pulchella var. *perpusilla* Hook. f., Fl. Brit. Ind. 7, 271 (1896).
C. perpusilla var. *muscosa* Hook. f. in Trim., Fl. Ceyl. 5, 270 (1900).
 Distribution: Southeast Asia.
 A very delicate species growing in wet soil.

Exsicc.—F. Ballard 1286, Ceylon; Stahl s.n., Nilgiris.

- ✓ 2. **Coelachne simpliciuscula** (Wight et Arn.) Munro ex Benth. in J. Linn. Soc. (Bot.) 19, 93 (1881).
Panicum simpliciusculum Wight et Arn. ex Steud., Syn. Pl. Glum. 1, 96 (1854).
Coelachne pulchella of Fl. Brit. Ind. 7, 270 (1896) non R.Br. (1810).
Isachne hispidula Nees ex Steud., loc. cit. 96.
 Distribution: Southeast Asia, China, Madagascar.
 A very variable species growing in marshy places.
 Exsicc.—Helfer s.n., Tenasserim; Bourne 1964, Madras; Thwaites C.P. 884, Ceylon.

✓ 3. *Coelachne minute* Bor

Isachne R.Br., Prod. Fl. Nov. Holl. 196 (1810).

Key to the species and varieties of *Isachne*

1. Spikelets not more than 1.5 mm long:—
2. Spikelets about 1 mm long; florets unequal in size and different in texture; leaves elliptic-acute, very thin *I. gracilis*
2. Spikelets up to 1.4 mm long; or if only 1 mm long then florets equal in size:—
3. Panicle less than 10 cm long; leaves up to 4.5 cm long, 7 mm wide; florets equal in size and of same texture:—
4. Panicle 7 cm long × 6 cm wide; glumes glabrous; upper lemmas hairy; leaves soft, elliptic or elliptic-lanceolate, 4.5 cm long *I. clarkei*
4. Panicle 3 cm long × 2.5 cm wide; glumes hispid or hairy; lemmas glabrous; leaves rigid, ovate-acute, 2 cm long or less; branches rigid, spreading with secund spikelets *I. confusa*
3. Panicle 4–10 cm long; leaves up to 4 cm long, 1 cm broad; florets unequal in size and of different texture. *I. pulchella*
1. Spikelets over 1.5 mm long:—
5. Spikelets 3.5–4.5 mm long:—
6. Florets equal in size and texture, barge-shaped, coriaceous; glumes not acuminate; pedicels with glandular bands; glumes 2–9-nerved; stems woody; leaves up to 25 cm long, lanceolate, with a glistening white margin *I. walkeri*
6. Florets unequal in size and different in texture, lower much thinner; glumes acuminate, longer than florets, often hispid with

bulbous-based hairs; no glandular bands on pedicels; leaves broadly elliptic-acute
I. bourneorum

5. Spikelets 1.5–3.5 mm long:—

7. Florets equal in size or nearly so and of same texture:—

8. Glumes longer than the florets:—

9. Glumes setosely hirsute:—

10. Glumes long-setose all over; panicle-branches setose; florets hemispherical; leaf-margins not thickened; lemmas and paleas glistening punctulate
I. lisboae

10. Glumes setose in upper half only; florets barge-shaped; lemmas hairy; leaf-margins thick, cartilaginous

I. kunthiana

9. Glumes hirtellous in upper half, at tip or glabrous:—

11. Wiry climbing plants; culms branching, over 1.2 m long, woody, slender; florets equal and of same texture, barge-shaped
I. angladei

11. Plants erect or prostrate at base:—

12. Glumes apiculate or compressed at the tips; leaves ovate, ovate-elliptic or elliptic; florets equal in size, barge-shaped
I. kunthiana var. *elator*

12. Glumes not apiculate; leaves linear:—

13. Leaves up to 35 cm long, 8–9 mm wide; culms stout, 4 mm thick; florets hemispherical, crustaceous
I. meeboldii

13. Leaves not more than 15 cm long, 3 mm wide; culms slender, 2 mm wide; florets equal, same texture, hemispherical
I. elegans

8. Glumes equal to or shorter than the florets (sometimes slightly longer in some spikelets in *I. albens* Trin.):—

14. Spikelets 2–2.5 mm long (also see *I. scabrosa* Hook. f.):—

15. Florets equal in size and texture, semiellipsoidal to hemispherical; pedicels with or without glandular bands; glumes hirtellous:—

16. Perennials:—

17. Glumes not apiculate; leaves not particularly rigid, not lanceolate and rounded at the base; pedicels with or without a solitary gland:—

18. Culms several to many from a wiry rhizome, not more than 20 cm tall; basal sheaths and leaves hairy; hairs fugacious; lower glume flat on back; leaves erect; pedicels eglandular
I. deccanensis

18. Culms single or few; tall plants up to 60 cm tall; basal sheaths and leaves glabrous; leaves spreading, long, linear; pedicels glandular
I. himalaica

17. Glumes apiculate, sometimes rounded, rather flat on the back; spikelets 2 mm long; lemmas shortly

- pubescent in the upper quarter; leaves very rigid, lanceolate, 5–10 cm long, with cartilaginous margins and rounded bases; pedicels with several glands
16. Annuals; basal sheaths thin, glabrous; leaves glabrous; florets hemispherical *I. kinabaluensis*
15. Florets narrowly elliptic in plan; pedicels glabrous; leaves hairy; glumes glabrous, shining *I. elegans*
14. Spikelets 1.5–1.75 mm long (up to 2 mm):— *I. sikkimensis*
19. Florets semiellipsoid to hemispherical:—
20. Sheaths scabrid; leaves rigid, very scabrid on the upper surface; spikelets 1.7–2 mm long *I. scabrosa*
20. Sheaths smooth; leaves stiff; linear-acuminate; panicle with many spikelets; florets white, coriaceous; pedicels eglandular; spikelets 1.5 mm long *I. albens*
21. Sheaths glabrous; glumes and lemmas glabrous *var. albens*
21. Sheaths densely hirsute; glumes hispidulous; lemma sublanate to puberulent *var. hirsuta*
19. Florets flattened like crumpets or millstones *I. dimyloides*
7. Florets unequal in size and of different texture; the lower more delicate:—
22. Glumes longer than the florets and stiffly pointed; upper floret about half the length of the lower floret:—
23. Spikelets 2.5 mm long; lower glume sparsely, the upper densely, setose *I. setosa*
23. Spikelets 3–3.5 mm long; glumes not, or only sparsely, setose *I. bourneorum*
22. Glumes equal to or shorter than the florets:—
24. Spikelets 2 mm or more long:—
25. Upper floret about half the length of the lower floret; the latter narrow, elliptic, barge-shaped; lower glume half the length of the lower lemma *I. multiflora*
25. Upper floret more than half as long as lower floret:—
26. Inflorescence a panicle:—
27. Panicle lax; leaf-blades narrowly lanceolate; pedicels with glandular bands:—
28. Spikelets 1.25–1.5 mm wide; lower and upper lemmas obtuse *I. globosa*
29. Panicle 2.5–4 cm long; leaf-blades up to 5 cm long *var. globosa*
29. Panicle 7–12 cm long; leaf-blades up to 10 cm long *var. effusa*
28. Spikelets 0.75–1 mm wide; lower and upper lemmas apiculate or at least acute *I. oreades*

27. Panicle dense; leaf-blades ovate-lanceolate *I. dispar*
 30. Nodes and leaves glabrous var. *dispar*
 30. Nodes setose and leaves villous var. *villosa*
 26. Inflorescence a raceme; dwarf plant *I. fischeri*
24. Spikelets 2 mm long or less:—
 31. Spikelets 2 mm long; anthers of the lower floret 0.75–1 mm long *I. miliacea*
 31. Spikelets not more than 1.6 mm long; anthers of the lower floret 0.3–0.4 mm long *I. pulchella*
1. ***Isachne albens* Trin.**, Sp. Gram. 1 (1826), t. 85.
I. latifolia Munro in Cat. Griffith, Falconer & Helfer Plants, 56 (1865) nomen.
I. griffithii Munro, loc. cit. 56 (1865) nomen.
 var. ***albens***.
 Distribution: Widely distributed in Southeast Asia.
 Exsicc.—N. L. Bor 6335, Naga Hills; Abdul Huk s.n., Burma; J. S. Gamble 27296, Jaunsar; C. B. Clarke 25053, Sikkim.
 var. ***hirsuta* Hook. f.**, Fl. Brit. Ind. 7, 23 (1896).
 Distribution: Surma Valley, Sylhet, Cachar.
 This variety is quite possibly a distinct species.
 Exsicc.—Keenan s.n., Cachar; Wallich 8657, Sylhet.
- ✓ 2. ***Isachne angladei* C. E. C. Fischer** in Kew Bull. 1932, 323 (1932).
 Distribution: South India, endemic.
 Exsicc.—L. Anglade 914, Palnis; Blatter et Hallberg 182, Anamallais.
3. ***Isachne bourneorum* C. E. C. Fischer** in Kew Bull. 1932, 324 (1932).
 Distribution: Madras, endemic.
 Exsicc.—Bourne 1041, 1249, 1481, etc., from the Pulneys.
4. ***Isachne clarkei* Hook. f.**, Fl. Brit. Ind. 7, 24 (1896).
 Distribution: Naga Hills.
 A very delicate species growing in marshy places.
 Exsicc.—N. L. Bor 18408, Naga Hills; C. B. Clarke 41588, Kohima.
5. ***Isachne confusa* Ohwi** in Bull. Tokyo Sci. Mus. 18, 14 (1947).
I. rigida Hook. f., Fl. Brit. Ind. 7, 24 (1896) non Nees ex Steud., Syn. Pl. Glum. 1, 95 (1854).
 Distribution: Tenasserim, southeast to Java.
 This species was considered by Munro to be the same as *Panicum piluliferum* Nees ex Steud., Syn. Pl. Glum. 1, 94 (1854), and Henrard made the tentative new combination, *Isachne pilulifera* (Nees) Henr. in Blumea 3, 471 (1940), but it is obvious that he did not see the type of *Panicum piluliferum*.
 Exsicc.—S. Kurz s.n., Nicobars; Helfer s.n., Tenasserim.
6. ***Isachne deccanensis* Bor** in Kew Bull. 1949, 95 (1949).
 Distribution: Madras, Nilgiris, endemic.
 Exsicc.—J. S. Gamble 15290, Nilgiris; E. Barnes s.n., Ootacamund.

Limnopoa C. E. Hubbard in Hook., Ic. Pl. (1943), t. 3432.

1. **Limnopoa meeboldii** (Fischer) C. E. Hubb. in Hook., Ic. Pl. 1943, sub tab. 3432.

Coelachne meeboldii C. E. C. Fischer in Kew Bull. 1934, 169 (1934).

Distribution: Cochin State, endemic.

A very strange species growing apparently in tanks, forming a thick mass of tangled stems on the surface of the water.

Exsicc.—Meebold 12520, Cochin.

Sphaerocaryum Nees ex Hook. f., Fl. Brit. Ind.
7, 246 (1896).

1. **Sphaerocaryum malaccense** (Trin.) Pilger in Fedde, Rep. Sp. Nov. 45, 2 (1938).

Panicum malaccense Trin., Gram. Panic. 204 (1826).

Sphaerocaryum pulchellum (Roth) A. Camus in Lecomte, Fl. Gén. de l'Indo-Chine 7, 514 (1923), based on *Isachne pulchella* Roth.

S. elegans Nees ex Steud., Nom. Bot. ed. 2, 2, 620 (1841).

Distribution: Assam, Ceylon, Burma, Southeast Asia to China.

A very delicate, pretty species, almost always confined to damp swampy localities. *Isachne pulchella* Roth, with which Hook. f. identified this species, is a true species of *Isachne*.

Exsicc.—A. A. Bullock 610, Manipur; F. Ballard 1515, Ceylon; Wallich 8736, Sylhet.

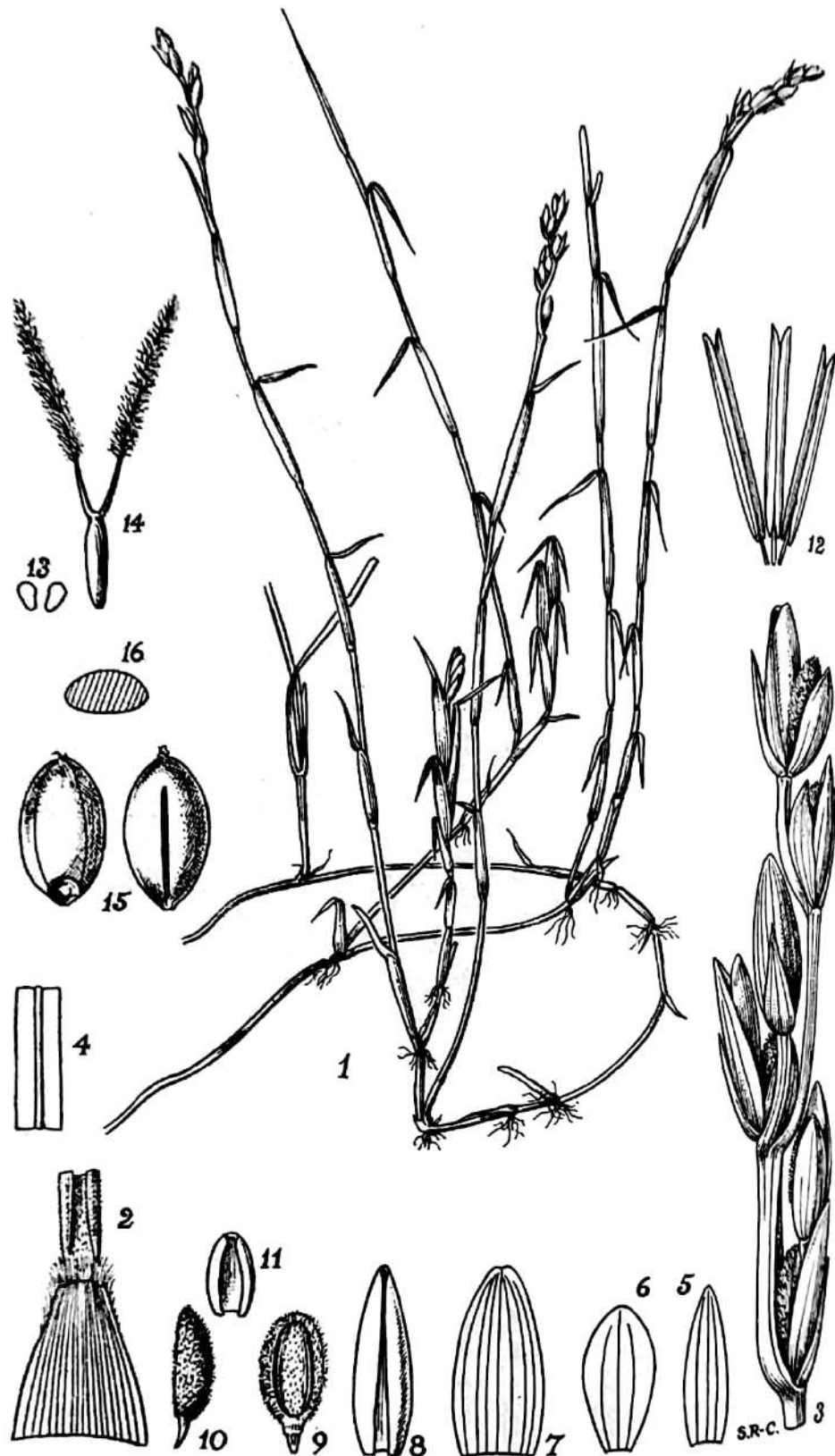


Fig. 62. *Limnopoa meeboldii* (C. E. C. Fisch.) C. E. Hubbard
 1, plant $\times 1$; 2, junction of sheath and blade to show ligule; 3, inflorescence;
 4, portion of rhachis; 5, lower glume; 6, upper glume; 7, lemma of lower floret;
 8, palea of same; 9 and 10, upper floret, front and side views respectively; 11, palea
 of upper floret, all $\times 6$; 12, stamens from lower floret; 13, lodicules from upper
 floret; 14, pistil from upper floret; 15, caryopsis, back and front views; 16, trans-
 verse section of caryopsis $\times 12$.

POOIDEAE—LEPTUREAE

LEPTUREAE *Holmb.* in Bot. Not. 1926, 80 (1926)

Spikelets 1-2-flowered, hermaphrodite, sessile, solitary, alternate, appressed to or sunken in the hollows of the joints on opposite sides of the readily disarticulating rhachis of slender cylindric spikes; rhachilla disarticulating above the glumes and between the florets, produced beyond the topmost floret and carrying a rudimentary floret. Lower glume absent; upper glume coriaceous, thick, tailed or not, eventually becoming coriaceous; lemma with its back to the rhachis, hyaline or membranous, awnless, 3-nerved; palea of the same texture, 2-nerved. Lodicules 2. Stamens 3. Styles 2, thick, distinct; stigmata plumose. Grain oblong, dorsally compressed; embryo longer than half the length of the grain; hilum punctiform, basal; starch-grains simple.

Low annual or perennial herbs spreading widely by means of stolons; leaves narrow, with saddle-shaped or transversely dumb-bell-shaped silica-cells; pyriform 2-celled micro-hairs sometimes present. Ligules very short, ciliate. Inflorescence a terminal spike.

Chromosomes small; basic number 9.

Genus: *Lepturus*

Lepturus *R.Br.*, Prod. Fl. Nov. Holl. 207 (1810).

Key to the species of *Lepturus*

1. Upper glume (i.e. the external) tailed or finely acuminate, lanceolate; spikelets 5-14 mm long, the terminal up to 18 mm long, 1-flowered

L. repens

1. Upper glume ovate-oblong or lanceolate-oblong, acute or acuminate but not drawn out into a short arista; spikelets 3-5 mm or the terminal 5-8 mm long, 2-flowered

L. radicans

1. ***Lepturus repens*** (*G. Forst.*) *R.Br.*, Prodr. Fl. Nov. Holl. 207 (1810).
Rottboellia repens *G. Forst.*, Prodr. 9 (1786).
Monerma repens (*G. Forst.*) *P. Beauv.*, Ess. Agrost. 117, 168, 177 (1812).

Distribution: Coasts of Ceylon, Laccadive Islands, Kenya, Mascarenes, Polynesia to Australia.

This species is found on the shores of Ceylon. $2n = 54$.

Exsicc.—*Ferguson* s.n., near Colombo, Ceylon.

2. ***Lepturus radicans*** (*Steud.*) *A. Camus* in Ann. Soc. Linn. Lyon, 1922, n.s., 69, 87 (1923).

Ophiurus radicans *Steud.*, Syn. Pl. Glum. 1, 430 (1855).

Monerma radicans (*Steud.*) *Hack.* in DC., Monogr. Phan. 6, 320 (1889).

POOIDEAE—LYGEEAE

LYGEEAE Lange, Pugill. Plant. Hisp. 24 (1860)

Spikelets all alike, 2-flowered, large, solitary, falling entire at maturity, short-pedicelled. Glumes absent; lemmas rather thick, fused together by their margins in the lower half, forming a stout cylindrical tube which is densely hairy all round, the upper halves free, divergent, rather thinner in texture, chartaceous to coriaceous; paleas also fused by their flattened backs in the lower part, entirely free from one another in the upper half, 2-nerved, 2-keeled; stamens 3; filaments long. Ovary glabrous; style and stigma solitary. Caryopsis tightly enclosed between lemma and palea; hilum linear, nearly the length of the grain; embryo small; starch-grains compound.

Perennial herbs. Leaf-blades rigid, convolute or involute, with festucoid anatomy; silica-cells circular to elliptic; 2-celled micro-hairs doubtfully present; ligules membranous. Spikelets at first enclosed in a terminal sheath-like spathe, at length laterally exerted.

Chromosomes large; basic number 10.

Genus: Lygeum

Lygeum Loefl. ex Linn., Gen. Pl. ed. 5, 27 (1754).

Linosparton Adans., Fam. 2, 34 (1763).

1. **Lygeum spartum** Loefl. ex Linn., Gen. Pl. ed. 5, addendum, pag. ult., post. ind. (1754).

Distribution: Mediterranean Region, usually in arid conditions.

There is one sheet of this species at Kew, said to have been collected at Pahlgam, Kashmir, by *Dharam Pal Bhandari*, in July 1928. The presence of this species in Kashmir is a puzzle—it may have escaped from a garden.



Fig. 63. *Lygeum spartum* Loebl. ex Linn.
 1, plant $\times \frac{1}{2}$; 2, spathe enclosing the spikelet with three of the six stamens and two styles and stigmas emerging $\times 1$; 3, spikelet—no glumes; bases of the lemmas fused; 4, one of the lemmas detached from its opposite $\times 1$; 5, one palea—the lower portion is common with its opposite number; 6, grain showing a linear hilum and small basal embryo; $\times 4$.

POOIDEAE—MELICEAE

MELICEAE *Reichb.*, *Consp. Reg. Veg.* 53 (1828) as *Melicaceae*

Spikelets 1- to several-flowered, laterally compressed, the lower florets hermaphrodite, the uppermost reduced and represented by a bundle of empty rudimentary lemmas; rachilla disarticulating above the glumes, with long internodes, crowned by rudimentary florets. Glumes equal or unequal, the lower 1-3-nerved, the upper 5-nerved, membranous; lemmas 5-9-nerved, longer than the glumes, compressed, hairy or glabrous, awnless; the lowest stipitate; palea hyaline, oblong, 2-keeled, ciliate on the keels. Lodicules 2, fused laterally. Ovary glabrous; styles 2, free; stigmas plumose. Grain oblong, fusiform or terete; hilum linear, elongate. Starch-grains compound.

Erect perennial herbs. Leaf-blades narrow, with festucoid anatomy; silica-cells simple; no micro-hairs. Margins of the leaf-sheaths fused. Spikelets arranged in open or spiciform or racemiform panicles, jointed or not on the pedicels. Ligules membranous or absent. First foliage-leaf of the seedling erect.

Chromosomes large; basic number 9.

Genus: Melica

Melica *Linn.*, *Gen. Pl.* ed. 5, 31 (1754) et in
Sp. Pl. ed. 1, 66 (1753).

Key to the species of *Melica*
(After Nevski)

1. Glumes rounded at the apex; lateral nerves of the obtuse lemma glabrous *M. nutans*
1. Glumes and lemmas usually acuminate or acute:—
 2. Lateral nerves of the lemmas more or less ciliate with long straight hairs; inflorescence of congested spike-like panicles:—
 3. Upper glume 8-9.5(10) mm long; the lower glume one-third to one-half as long:—
 - 3a. Sheaths completely glabrous *M. inaequiglumis*
 - 3a. Sheaths and both sides of the blades covered with whitish hairs *M. persica*
 3. Upper glume 6-7 mm long; the lower glume about half as long or longer:—
 4. Sheaths completely glabrous, more or less scabrid *M. jacquemontii*
 4. Sheaths (lower) more or less pilose, never glabrous:—
 5. Lower sheaths pilose with reflexed hairs, the upper sheaths and lower surfaces of the blades glabrous, scaberulous; upper surface of the blades puberulous *M. hohenackeri*

5. All sheaths and both sides of the blades pilose *M. canescens*
2. Lemmas glabrous on the dorsal surface and side nerves; inflorescence with long ascending or spreading branches, if spike-like, spikelets well spaced:—
6. Glumes hyaline, transparent; tip of lemma broadly hyaline; inflorescence racemose with shortly pedicellate spikelets, rarely branched, but if so, branches short *M. secunda*
6. Glumes not particularly hyaline; tip of the lemma very shortly hyaline; branches long, up to 15 cm long:—
7. Spikelets up to 7 mm long; lemmas about 5 mm long; sheaths scabrid but not covered with reflexed hairs nor margin of sheaths hirsute; anthers less than 1 mm long; branches ascending, often divided again *M. onoei*
7. Spikelets up to 12 mm long; lemmas about 7 mm long; sheaths with reflexed hairs on the nerves and margins hirsute above; anthers 1.5–2 mm long; branches spreading, finally reflexed *M. scaberrima*

1. ***Melica canescens*** (Rgl.) *Laurenko* in *Komarov*, Fl. U.S.S.R. 2, 752 (1934).

M. cupani δ *canescens* Regel, Descr. Pl. Nov., fasc. 8, 88 (1880).

Distribution: Persia to Northwest India.

Exsicc.—R. R. Stewart 22926, Kashmir; A. V. Monro s.n., Baluchistan; Griffith 134, Afghanistan.

2. ***Melica hohenackeri*** Boiss., Diagn. sér. 1, 13, 54 (1853).

M. cupani ϵ *hohenackeri* Boiss., Fl. Orient 5, 590 (1884).

M. persica β *caspiica* Griseb. in Ledeb., Fl. Ross. 4, 398 (1853).

Distribution: Persia to Northwest India.

Exsicc.—Griffith 6676, Afghanistan; Inayat 25775, Kashmir.

3. ***Melica inaequiglumis*** Boiss., Diagn. sér. 1, 7, 124 (1846).

M. cupani γ *inaequiglumis* Boiss., Fl. Orient. 5, 590 (1884).

Distribution: Persia, Iraq, Afghanistan to northwest India.

Exsicc.—Major Toppin 228, Chitral.

4. ***Melica jacquemontii*** Dcne. in Jacq., Voy. Bot. 4, 174 (1844), t. 175.

M. breviflora Boiss., Diagn. sér. 1, 7, 124 (1846).

M. cupani Hook. f., Fl. Brit. Ind. 7, 329 (1896) in part, non Guss. (1896).

Distribution: Northwest India to Persia.

Exsicc.—Jacquemont 1490, northwest India; N. L. Bor 16449, Lahul; R. R. Stewart 22230, Kashmir.

5. ***Melica nutans*** Linn., Sp. Pl. ed. 1, 66 (1753).

Distribution: Europe to northwest India.

A handsome grass usually found in shady places, often on calcareous rocks.

Exsicc.—R. R. Stewart 7981, Kashmir; J. F. Duthie 11396, Gulmarg.

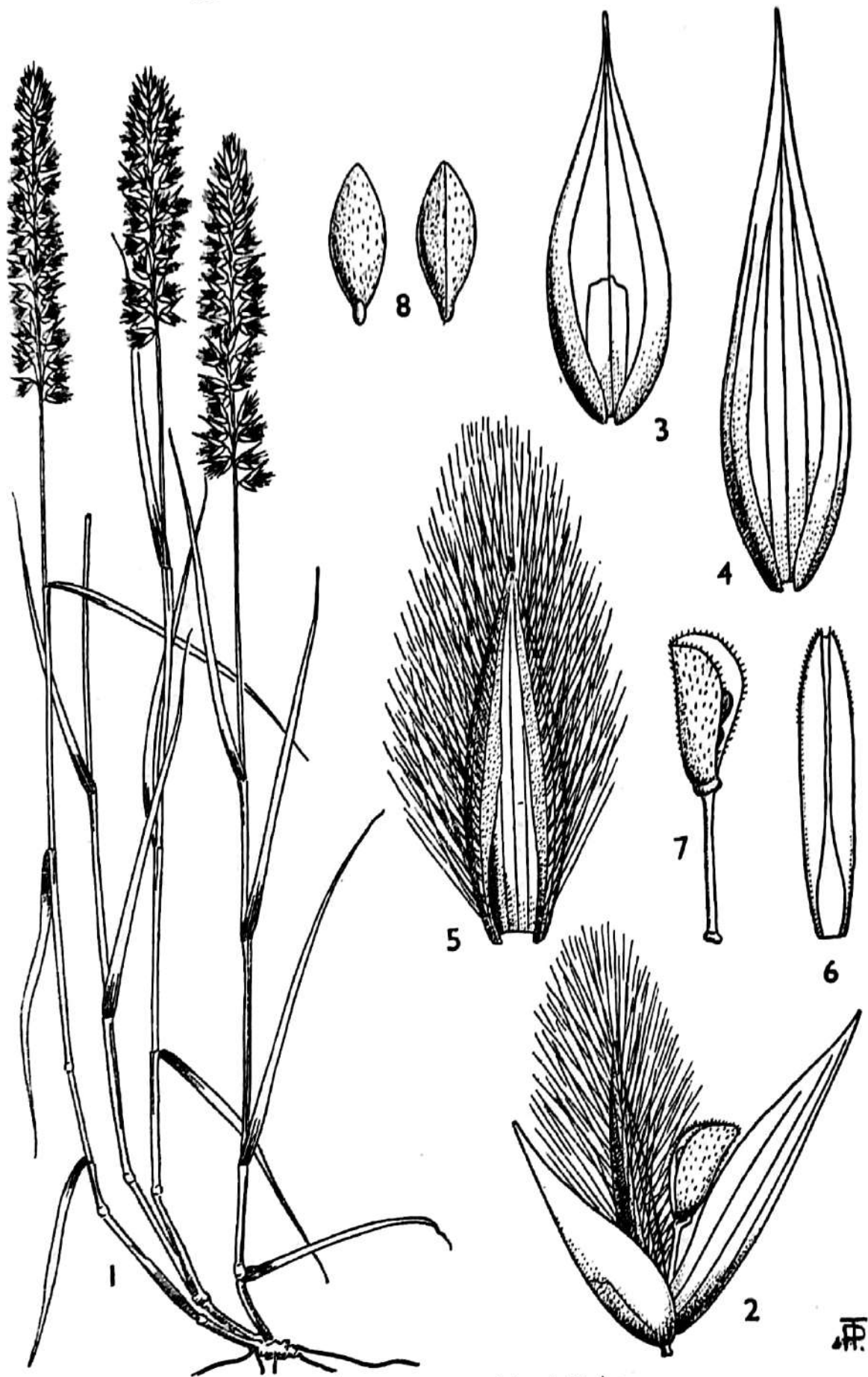


Fig. 64. *Melica inaequiglumis* Boiss.

1, plant $\times \frac{1}{3}$; 2, spikelet $\times 8$; 3, lower glume; 4, upper glume; 5, lemma; 6, palea; 7, rhachilla surmounted by imperfect spikelets; 8, grain showing embryo and hilum; all $\times 12$.

POOIDEAE—MILIEAE

MILIEAE Endl., Fl. Poson. 109 (1830) as *Miliaceae*

Spikelets 1-flowered, slightly dorsally compressed; rhachilla disarticulating above the glumes. Glumes 3-nerved, herbaceous-membranous, equal to or longer than the lemma, subequal, persistent; nerves parallel, not reaching the tip of the glumes. Lemmas smooth and glossy, convex on the back, obscurely 5-nerved, chartaceous, becoming strongly indurated in the fruit; palea of the same texture, also becoming strongly indurated in the fruit, 2-nerved. Lodicules 2, acute, entire. Stamens 3. Ovary glabrous, without an appendage; styles free. Caryopsis with a linear hilum one-third to two-thirds the length of the caryopsis; embryo small; starch-grains compound.

Annual or perennial herbs. Leaves linear to narrowly lanceolate, with chlorenchyma evenly distributed between the vascular strands (festucoid); silica-cells few or absent; no 2-celled micro-hairs; ligule glabrous. First foliage leaves of the seedling narrow and erect. Inflorescence an effuse or narrow panicle.

Chromosomes large or rather small; basic number 4 or 7.

Genus: Milium

Milium Linn., Gen. Pl. ed. 5, 30 (1754) et in
Sp. Pl. ed. 1, 61 (1753).

1. **Milium effusum** Linn. Sp. Pl. ed. 1, 61 (1753).
Miliarium effusum (Linn.) Moench, Meth. Pl. 204 (1794).
Melica effusa (Linn.) Salisb., Prodr. Stirp. 20 (1796).
Paspalum effusum (Linn.) Rasp. in Ann. Sci. Nat. Bot. 5, 301 (1825).

Distribution: Widespread in Europe and Asia.

This is a woodland grass and is also occasionally grown for ornament.

$2n = 28$ (Tateoka).

Exsicc.—R. R. Stewart 21792, Kashmir; Griffith s.n., Afghanistan.

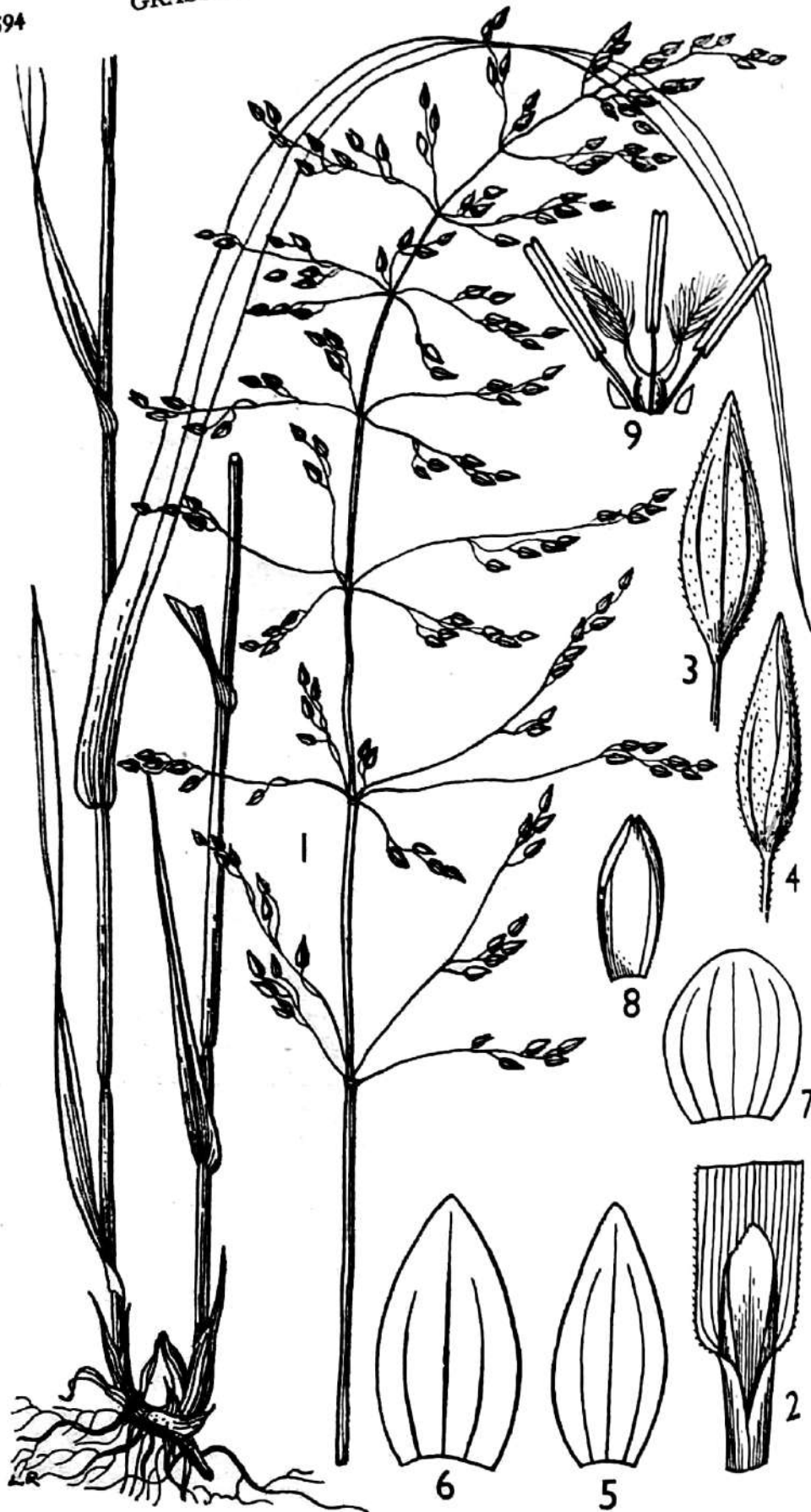


Fig. 65. *Milium effusum* Linn.
 1, plant and inflorescence $\times \frac{1}{2}$; 2, ligule $\times 6$; 3 and 4, spikelet; 5 and 6, glumes;
 7, lemma; 8, palea; 9, stamens, ovary and lodicules; all $\times 10$.

POOIDEAE—MONERMEAE

MONERMEAE C. E. Hubb. in Hutch., Brit. Flow. Pl. 332 (1948)

Spikelets all alike, sessile, solitary, alternate or rarely opposite, sunk in the hollows of the articulate rhachis, falling entire with the adjacent joint of the rhachis, 1-2-flowered. Glumes more or less equal, coriaceous, longer than the lemma, placed side to side in front of the latter; lemma awnless, nearly as long as the glumes, hyaline, 1-3-nerved; palea 2-nerved, hyaline. Lodicules 2, entire, glabrous. Stamens 3. Ovary lobed and appendaged at the apex; styles obsolete, free. Grain terete, enclosed by the glumes, lemma and palea; hilum narrowly oblong or elliptic; embryo small; starch-grains compound.

Annual herbs. Leaf-blades narrow with festucoid anatomy; silica-cells oblong, elliptic or rounded; 2-celled micro-hairs absent. Ligule membranous, glabrous. First foliage leaf of the seedling slender and erect. Inflorescence a cylindrical spike, disarticulating at maturity.

Chromosomes large; basic number 7 or 13.

Genus: Parapholis

Parapholis C. E. Hubbard in Blumea, Suppl. 3, 14 (1946).

1. **Parapholis incurva** (Linn.) C. E. Hubb. in Blumea, Suppl. 3, 14 (1946).

Aegilops incurva Linn. Sp. Pl. ed. 1, 1051 (1753).

Lepturus incurvatus Trin., Fund. Agrost. 123 (1820).

Pholiurus incurvatus (Trin.) Hitchc. in U.S. Agric. Bull. no. 772, 106 (1920).

Ph. incurvus (Linn.) Schinz et Thell. in Vierteljschrift. Nat. Ges. Zürich 66, 265 (1921).

Distribution: Widespread in Europe and Mediterranean Region, extending to northwest India.

Exsicc.—M. B. Raizada s.n., Rawalpindi; R. R. Stewart 13749, ibidem, Topi Park, by water; Col. G. Wingate s.n., northwest India; Griffith s.n., Afghanistan. $2n = 36$.

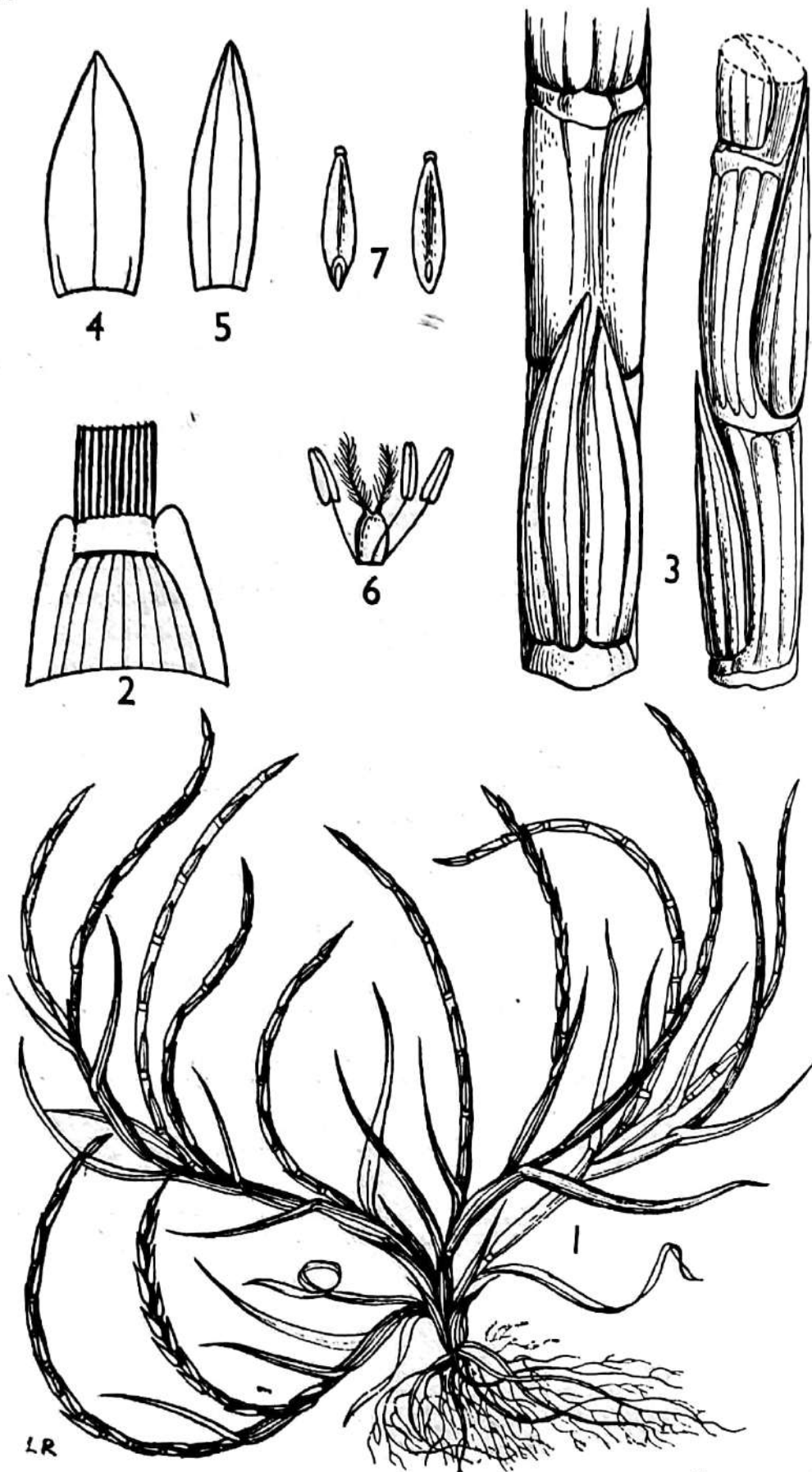


Fig. 66. *Parapholis incurva* (Linn.) C. E. Hubbard
 1, plant $\times 1$; 2, ligule; 3, front view of portion of the spike, showing the lower and upper glume lying side to side, side view of same; 4, lemma; 5, palea; 6, stamens and ovary; 7, grain, showing left, embryo, and right, hilum; all $\times 8$.

POOIDEAE—ORYZEAE

ORYZEAE Dumort., Obs. Gram. Belg. 83, 135 (1823)

Spikelets all alike, hermaphrodite, 1- rarely 3-flowered, with the terminal floret hermaphrodite and the two lower reduced to scale-like lemmas; rhachilla disarticulating above the glumes. Glumes very minute or suppressed, sometimes represented by two flattened minute lips; lemmas of two kinds; the lower scale-like and empty or entirely suppressed; the upper, in the hermaphrodite spikelets, membranous or coriaceous, 3-9-nerved, awnless or awned from the tip, similar in texture and shape to the palea. Lodicules 2, 2-lobed or entire. Stamens 6, or 3 or 1; filaments long. Ovary with 2 styles and 2 laterally exerted stigmas. Caryopsis with a well-developed linear hilum; starch-grains compound.

Annual or perennial herbs, usually aquatic; leaf-blades narrow or broad; chlorenchyma evenly distributed between the vascular strands; silica-cells dumb-bell-shaped, placed transversely; micro-hairs elongate. The first foliage leaf of the seedling is flat, broad and horizontal. Ligule membranous, eventually splitting and becoming lacerate, rarely absent.

Inflorescence of pedicelled spikelets in open or contracted panicles.

Chromosomes small; basic number 12.

Genera: *Hygroryza*
Leersia

Oryza
Zizania

Key to the genera of Oryzeae

1. Spikelets unisexual; upper branches bearing female spikelets; the lower bearing male spikelets; tall aquatic annuals or perennials, reed-like **Zizania**
1. Spikelets hermaphrodite:—
 2. Leaf-blades ovate-oblong or ovate-lanceolate with inflated sheaths; a floating grass; glumes absent; floret one; lemma awned **Hygroryza**
 2. Leaf-blades linear, acute or acuminate; aquatic, forest or savannah grasses:—
 3. Fertile lemma supported by two empty scales; tip of pedicel with 2 lips **Oryza**
 3. Fertile lemma solitary; tip of pedicel without lips; spikelets imbricate **Leersia**

Hygroryza Nees in Edinb. New Phil. J. 15,
380 (1833).

1. **Hygroryza aristata** (Retz.) Nees ex Wight and Arn. in Edinb. New Phil. J. 15, 380 (1833).

Pharus aristatus Retz., Obs. Bot. 5, 23 (1789).

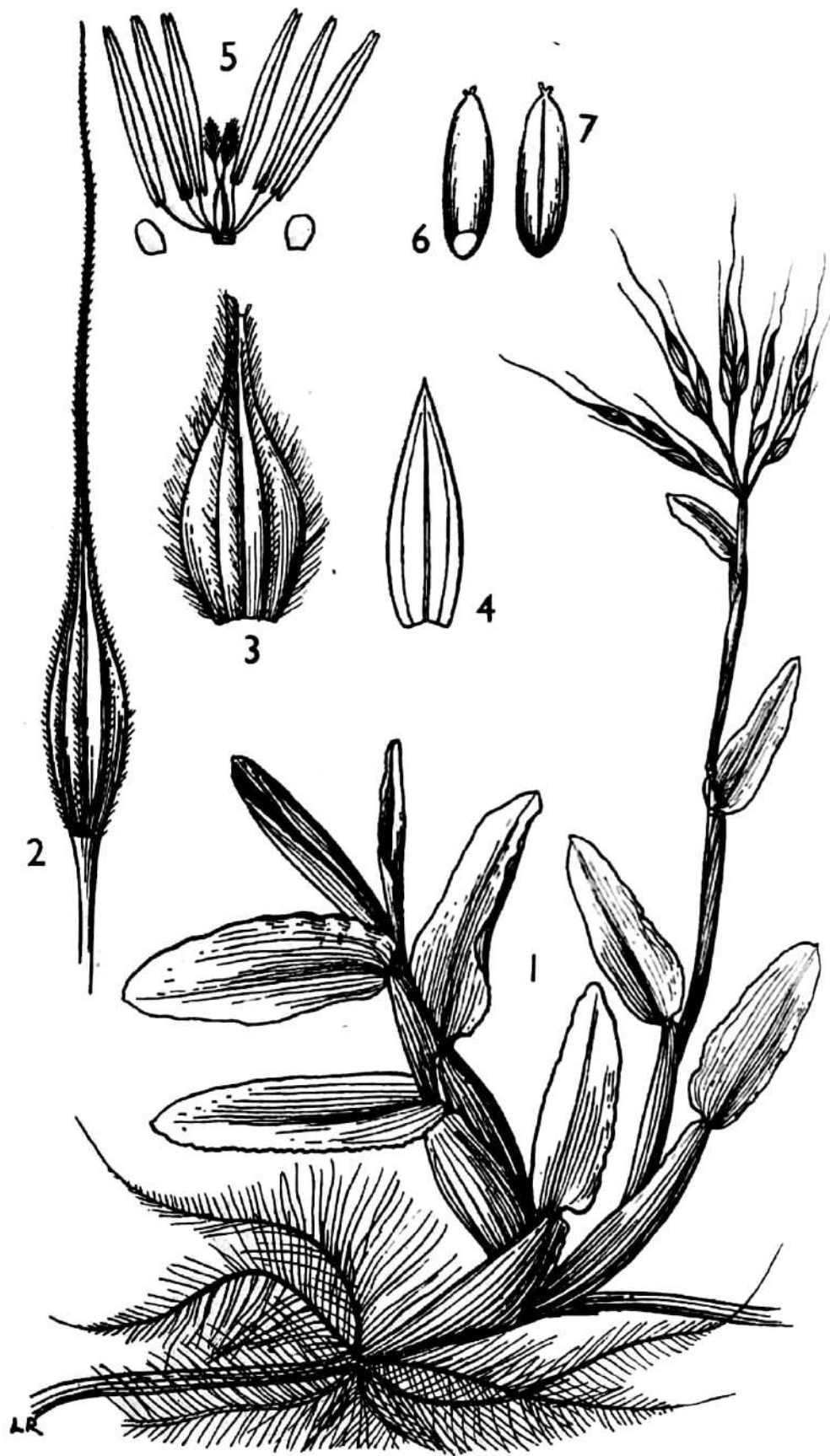


Fig. 67. *Hygroryza aristata* (Retz.) Nees
 1, plant $\times 1$; 2, spikelet—there are no glumes; 3, lemma without awn; 4, palea;
 5, flower including stamens, ovary and lodicules; 6, grain showing embryo; 7,
 grain showing a linear hilum; all $\times 8$.

Leersia aristata (Retz.) Roxb., Fl. Ind. ed. 2, 2, 207 (1832).

Zizania aristata (Retz.) Kunth, R v. Gram. 1, 8 (1829).

Z. retzii Spreng., Syst. Veg. 2, 136 (1825).

Potamochoa retzii Griff. in J. Asiat. Soc. Beng. 5, 571 (1836), t. 24.

Distribution: India (except in the northwest), Ceylon, Burma and South-east Asia generally.

This species forms floating masses, often of considerable extent, in lakes and slow-moving streams. Cattle are fond of this grass and the grain is said to be eaten by the poorer people. Keenan says that it is sometimes cultivated in Assam in the rivers by local people for fodder in the cold weather. $2n = 24$ (Hirayoshu).

Exsicc.—Royle s.n., Northwest India; Thwaites C.P. 878, Ceylon; Griffith 6442, Bengal; Meebold 10527, Mysore.

Leersia Soland. ex Sw., Prod. Veg. Ind. Occ. 21 (1788)

nomen genericum conservandum.

Blepharochloa Endl., Gen. 1352 (1841).

Homalocenchrus Mieg, Acta Helv. Phys. 4, 307 (1760).

Key to the species of *Leersia*

1. Spikelets imbricate, 4–5 mm long, oblong, covered on the sides with spaced, short, appressed hairs, panicle 15–20 cm long, 4–10 cm broad
L. hackelii

1. Spikelets closely imbricate, 2.5–3.5(4) mm long, oblong, plano-convex, smooth on the sides; panicle less, often much less, than 10 cm long
L. hexandra

1. *Leersia hackelii* Keng in Sinensia 11, 412 (1940).

L. oryzoides Sw. var. *japonica* Hack. in Bull. Herb. Boiss. 7, 645 (1899) non *L. japonica* Makino (1892).

L. oryzoides Hook. f., Fl. Brit. Ind. 7, 94 (1896) non Sw. (1788).

Distribution: Northwest India, particularly in Kashmir.

This species is found growing in water in ditches and on the margins of lakes.

Exsicc.—Inayat s.n., Hazara; R. R. Stewart 22420, Kashmir.

✓ 2. *Leersia hexandra* Swartz, Prod. Veg. Ind. Occ. 21 (1788).

Pharus ciliatus Retz., Obs. Bot. 5, 23 (1789).

Leersia australis R.Br., Prod. 210 (1810).

L. mexicana Kunth in H.B.K., Nov. Gen. et Sp. 1, 195 (1816).

L. luzonensis J. S. Presl ex C. B. Presl, Rel. Haenk. 1, 207 (1830).

L. parviflora Desv., Opusc. 61 (1831).

L. mauritanica Salzm. ex Trin. in M m. Acad. Sci. P tersb. s r. 6, 5, 174 (1840).

L. triniana Sieb. ex Trin., loc. cit.

L. abyssinica Hochst. ex A. Rich., Tent. Fl. Abyss. 2, 356 (1851).

L. griffithiana C. Muell. in Bot. Zeit. 14, 345 (1856).

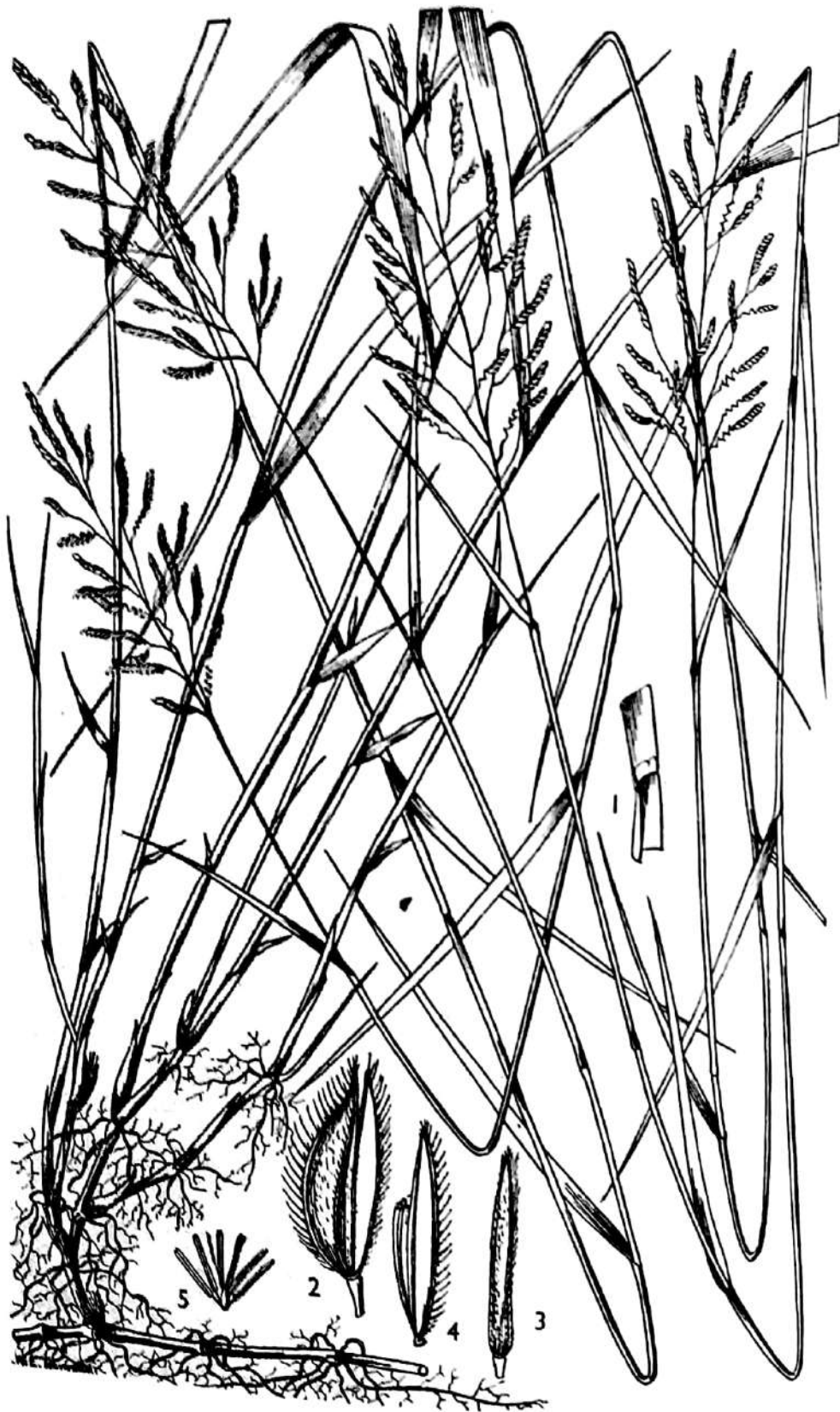


Fig. 68. *Leersia hexandra* Sw.
 Plant $\times \frac{1}{4}$. 1, ligule; 2, spikelet, showing lemma and palea; 3 and 4, palea from back and in side view; 5, stamens and ovary; all $\times 6$.

L. capensis C. Muell., loc. cit. 345.

Asprella hexandra, *A. australis* and *A. mexicana* Roem. et Schult., Syst. Veg. 2, 267, 551 (1817).

Oryza hexandra Doell in Mart., Fl. Bras. 2, 2, 10 (1871).

O. australis A.Br. ex Schweinf., Beitr. Fl. Aethiop. 300 (1867) nomen.

Distribution: Tropics of the Old and New Worlds.

This species grows in a variety of moist habitats, from paddy fields to the floating grass islands in the Logtak Lake, Manipur. It is eaten by cattle and buffaloes. $2n = 48$ (Ramiah).

Exsicc.—D. C. Mukerjee 38, Assam; Nusker 1234, Bengal; Meebold 6446, Manipur; Macrae 181, Ceylon; U Thein Lwin 180, Burma; Bourne 2475, Madras.

A specimen of *Leersia* collected by N. L. Bor (18109) in the Logtak Lake, Manipur, has spikelets which are 4.5–5 mm long, and a very large panicle; it may be distinct.

Oryza Linn., Gen. Pl. ed. 5, 155 (1754) et in
Sp. Pl. ed. 1, 333 (1753).

Key to the species and varieties of *Oryza*

1. Ligule of the lower leaves very long, 15–45 mm long:—
 2. Spikelets persistent:—
 3. Mature floret with 1 grain *O. sativa* var. *sativa*
 3. Mature floret with 2–3 grains *O. sativa* var. *plena*
 2. Spikelets caducous *O. rufipogon*
1. Ligule of the lower leaves much shorter, not more than 6 mm long:—
 4. Spikelets very narrow, linear, 1–1.5 mm broad; awns very slender, long; empty lemmas subulate *O. brachyantha*
 4. Spikelets broader, 2–3 mm broad:—
 5. Empty lemmas as long as or nearly as long as the fertile lemma and of the same texture, not subulate *O. grandiglumis*
 5. Empty lemmas much shorter than the fertile lemma and thinner in texture, linear, lanceolate or subulate:—
 6. Spikelets absolutely glabrous; rarely awned:—
 7. Spikelets over 10 mm long; fertile lemma and palea winged at the top; empty lemmas subulate; panicle contracted *O. coarctata*
 7. Spikelets less than 10 mm long; fertile lemma and palea not winged at the top, glabrous but not smooth; empty lemmas not subulate; panicle narrow or spreading:—
 8. Surface of the fertile lemma and palea coarsely and irregularly granulate; panicle, narrow; branches 2–3 cm long; spikelets ovate-oblong, 5–6.5 mm long, grey *O. granulata*
 8. Surface of the fertile lemma and palea smooth, very finely and regularly vertically and horizontally striate; spikelets

GRASSES OF INDIA, BURMA AND CEYLON

- 8-9 mm long, oblong, yellow, dark brown or black; branches of the panicle long
O. glaberrima
6. Spikelets hispid and/or pectinate-ciliate on the keels:—
O. glaberrima
9. Spikelets persistent; fertile lemma and palea yellow or black; empty lemmas long or short
O. glaberrima
9. Spikelets not persistent, caducous; empty lemmas linear, lanceolate or subulate, long or short:—
O. glaberrima
10. Empty lemmas linear or linear-lanceolate:—
O. breviligulata
11. Awns 10-20 cm long, pale purplish towards the tips; spikelets 9-11 mm long
O. breviligulata
11. Awns not above 5 cm long; spikelets shorter:—
O. australiensis
12. Axis of the inflorescence increasingly hispid-scabrid towards the top; spikelets 7.5 mm long
O. australiensis
12. Axis of the inflorescence glabrous or hairy in the axils of the branches:—
O. latifolia
13. Ligule covered with matted hairs on the dorsal surface; leaves very broad (up to 4 cm) and long, with large auricles at the base; spikelets 4-6 mm long
O. latifolia
13. Ligule not covered with matted hairs; leaves very much narrower; spikelets 4-5 mm long:—
O. minuta
14. Panicle loose with spreading branches; spikelets broadly oblong, 4-5 mm long, 2.3-2.5 mm wide, unawned or shortly awned, brown or black when ripe; leaves not auricled
O. minuta
14. Panicle contracted with short ascending branches; spikelets oblong, about 2 mm wide, awned; awn very slender, flexuous, up to 3 cm long; leaves auricled at the base
O. eichingeri
10. Empty lemmas subulate or setaceous from a broader base:—
O. brachyantha
15. Empty lemmas not half as long as the spikelet, subulate; fertile lemma and palea pectinate-ciliate at the tips only, otherwise smooth and glabrous; awns up to 15 cm long
O. brachyantha
15. Empty lemmas setaceous, longer than half the length of the spikelet; fertile lemma and palea coarsely pectinate on the keel with the interspaces minutely scaberulous; awns much shorter, not more than 10 mm long
O. ridleyi

1. *Oryza australiensis* Domin in Bibl. Bot. 85, 333 (1915).
Distribution: Queensland and North Australia.
This species has been introduced into India.

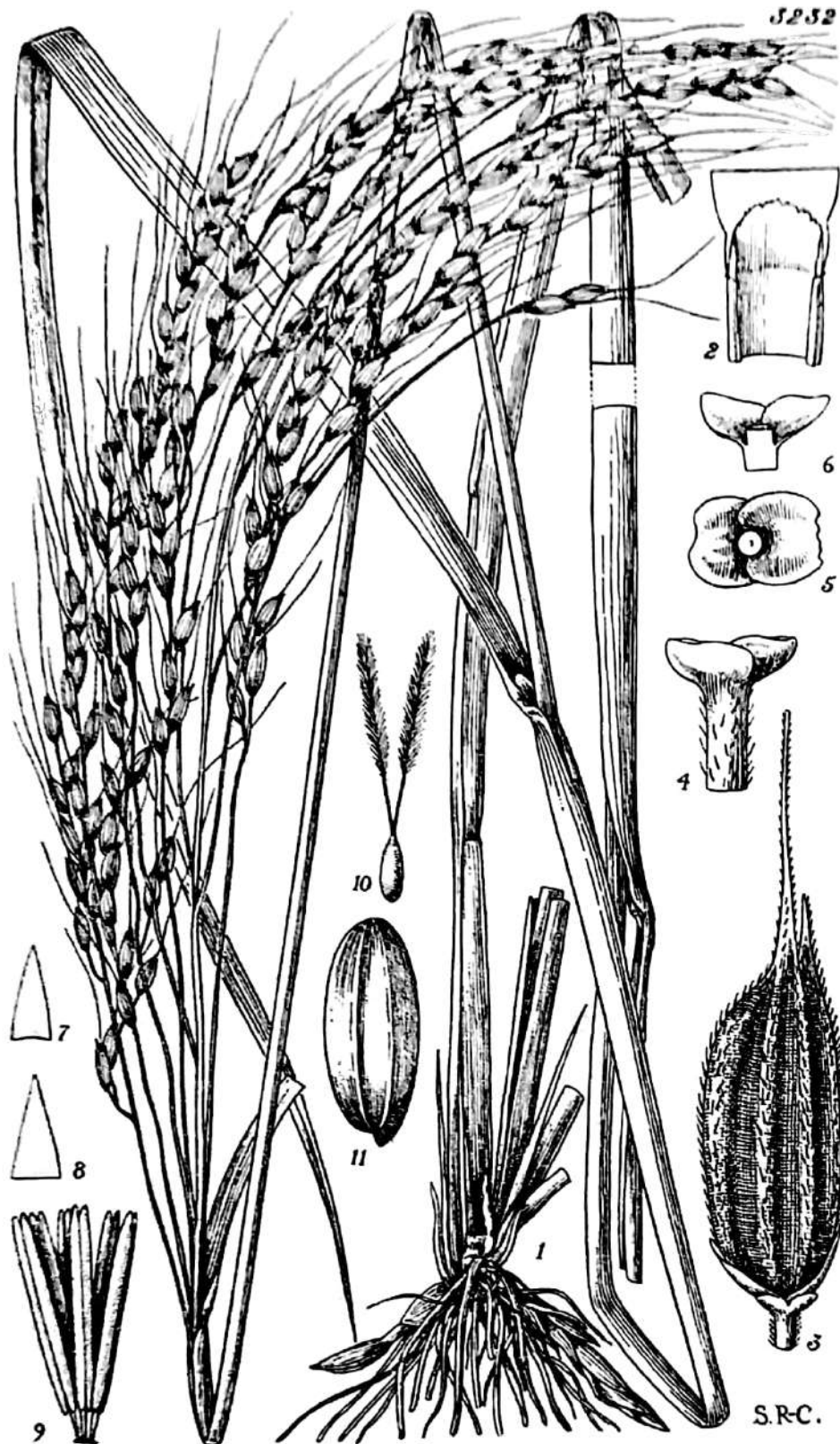


Fig. 69. *Oryza australiensis* Domin^f

1, plant; 2, ligule $\times 3$; 3, spikelet with portion of awn removed $\times 6$; 4, 5 and 6, glumes $\times 12$; 7 and 8, sterile lemmas $\times 6$; 9, stamens $\times 6$; 10, gynaecium $\times 16$; 11, caryopsis $\times 6$.

imaginable habitat, varying from deep water flooded plains to dry hill slopes at 1500 m.

A hybrid between *Oryza sativa* Linn. ($2n = 24$) and *O. eichingeri* ($2n = 48$) with the expected number $2n = 36$ has been raised at Coimbatore by Sampath [*Curr. Sci.* **19**, 185 (1950)]. It is completely sterile. var. *plena* Prain, Bengal plants **2**, 1184 (1903).

O. plena (Prain) Chowdhury in Indian For. **75**, 497 (1949).

The "multiple-seeded" rice of India is distinguished from the more usual *O. sativa* by the possession of 2-3 grains in a spikelet.

The descriptions of two new species have recently been published.

1. *Oryza jeyporensis* Govindaswami et Krishnamurthy in Sci. and Cult. **24**, 234-236 (1958). It is said to resemble *O. glaberrima* in gross morphological details but to differ from it markedly in several respects. $2n = 24$. The type was collected in Orissa.

2. *O. malampuzhaensis* Krishnaswami et Chandrasekharan in Madras Agric. J. **45**, 471-72 (1958). $2n = 48$. This species was collected in the Anamalai Hills.

Neither of these species has been seen.

Zizania Linn., Gen Pl. ed. 5, 427 (1754) et in Sp. Pl. ed. 1, 991 (1753).

Fartis Adans., Fam. **2**, 37 (1763).

Hydropyrum Link, Hort. Berol. **1**, 252 (1827).

Melinum Link, Handb. **1**, 96 (1829).

1. *Zizania latifolia* (Griseb.) Stapf in Kew Bull. **1909**, 385 (1909).

Z. latifolia Turcz. in Bull. Soc. Nat. Mosc. **105** (1838) nomen.

Hydropyrum latifolium Griseb. in Ledeb., Fl. Ross. **4**, 466 (1853).

Distribution: China, Japan, South Russia and northeast India and Burma.

This grass forms an important part of the floating grass islands in the Logtak Lake, Manipur. $2n = 34$ (Hirayoshu).

Exsicc.—Meebold 6448, Manipur; Abdul Khalil s.n., Shan States, Burma.

POOIDEAE—PAPPOPHOREAE

PAPPOPHOREAE *Kunth, Rév. Gram. 1, 82 (1829)*

Spikelets all alike, 2-3- to many-flowered, with the lower florets hermaphrodite and the upper male or barren and often much reduced; rhachilla disarticulating above the glumes and continuous between the florets. Glumes similar, usually as long as the florets, 3-5-7-nerved, membranous; lemmas similar in texture to the glumes, very broad, rounded on the back, 9- to many-nerved, with the nerves continued out as antrorsely scabrid or ciliate awns; uppermost lemma reduced to a bundle of awns; palea elliptic-obtuse or truncate when flattened, 2-nerved, 2-keeled. Lodicules 2, minute, cuneate, fleshy. Ovary glabrous; styles distinct, short; stigmas plumose. Grain oblong, more or less compressed; hilum basal, punctiform; embryo long. Starch-grains compound.

Perennial or annual herbs. Leaf-blades usually narrow, often convolute, with mixed festucoid and panicoid anatomy; silica-cells saddle-shaped; micro-hairs with a glandular-head upon a long slender stalk. Spikelets arranged in a somewhat narrow handsome bristly panicle. Ligule a ridge of hairs.

Chromosomes small; basic number 10.

Genus: *Enneapogon*

Enneapogon Desv. ex P. Beauv., Ess. Agrost.

81 (1812); J. Bot. 3, 70 (1814).

Pappophorum Schreb., Gen. 2, 787 (1791) partim.

Key to the species of *Enneapogon*

1. Four of the awns much shorter than the other five; lemma plus longer awns over 8 mm long:—
 2. Palea about twice as long as the lemma, ciliate on the keel but glabrous on the flaps; lemma hairy inside at the base of the awns; panicle up to 12 cm long, dense, flexuous, greyish *E. cenchroides*
 2. Palea about as long as the lemma, ciliate on the keel and hairy on the flaps; panicle up to 10 cm long, dense, erect, often pinkish *E. persicus*
1. All awns more or less the same length; lemma plus awns less than 6 mm long:—
 3. Basal leaves setaceous, thread-like; panicle steel-grey, short, compact; awns shortly ciliate, not bristly, straight; palea longer than broad, shortly ciliate on the keels *E. brachystachyus*
 3. Basal leaves not filiform; panicle often with a purplish-grey tinge; awns markedly ciliate, bristly, curved at maturity; palea long-ciliate on the keels *E. elegans*

RR

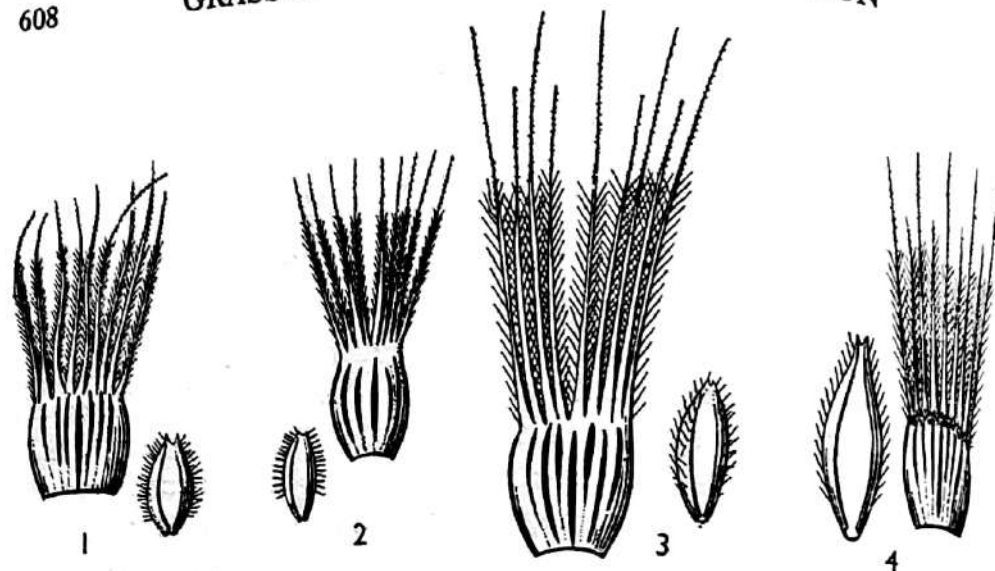


Fig. 70. Lowest lemmas and their paleas of the four species of *Enneapogon*. 1, *E. elegans* (Nees ex Steud.) Stapf; 2, *E. brachystachyus* (Jaub. et Spach) Stapf; 3, *E. persicus* Boiss.; 4, *E. cenchroides* (Licht.) C. E. Hubb.; all $\times 5$.

see. *Goldend.*

1. *Enneapogon* ~~*brachystachyus*~~ ^{*desvauxii* P. Beau} (Jaub. et Spach) Stapf in Dyer, Fl. Cap. 7, 654 (1900).

Pappophorum phleoides Trin. in Spreng., Neue Entdeck. 2, 73 (1821) nomen.

P. brachystachyum Jaub. et Spach in Ann. Sci. Nat. Bot. sér. 3, 14, 365 (1850) et in Ill. Pl. Or. 4, 34 (1851), t. 324.

P. figarianum Fig. et De Not. in Mem. Acc. Torin. sér. 2, 12, 254 (1852).

P. bulbosum Fig. et De Not. loc. cit.

P. vincentianum Schmidt, Beitr. Fl. Cap. Verd. Ins. 144 (1852).

P. nanum Steud. Syn. Pl. Glum. 1, 200 (1854).

P. senegalense Steud. loc. cit. 199.

Distribution: Deserts of northwest India, North and South Africa.

Occasionally gregarious in the desert.

Exsicc.—D. Gupta s.n., Bikanir. $2n = 36$.

Axillary cleistogenes are borne at the lowest or lower nodes of the culm. They are described by Mrs. Chase (*Amer. J. Bot.* 5, 256, 1918) as follows: "The cleistogene, which is sometimes so rotund as to split the sheath in which it is borne, consists of a floret without glumes and a rachilla joint with a minute rudiment of a second floret. The lemma is more or less split into a few closely appressed lobes. The prophyllum is thin in texture and is usually not split."

2. *Enneapogon cenchroides* (Licht.) C. E. Hubb. in Kew Bull. 1934, 119 (1934).

E. mollis Lehm., Pugill. 3, 40 (1831).

Pappophorum cenchroides Licht. ex Roem. et Schult., Syst. Veg. 2, 616 (1817).

P. robustum Hook. f., Fl. Brit. Ind. 7, 302 (1896).

Distribution: Upper Gangetic plain, Tropical and South Africa.

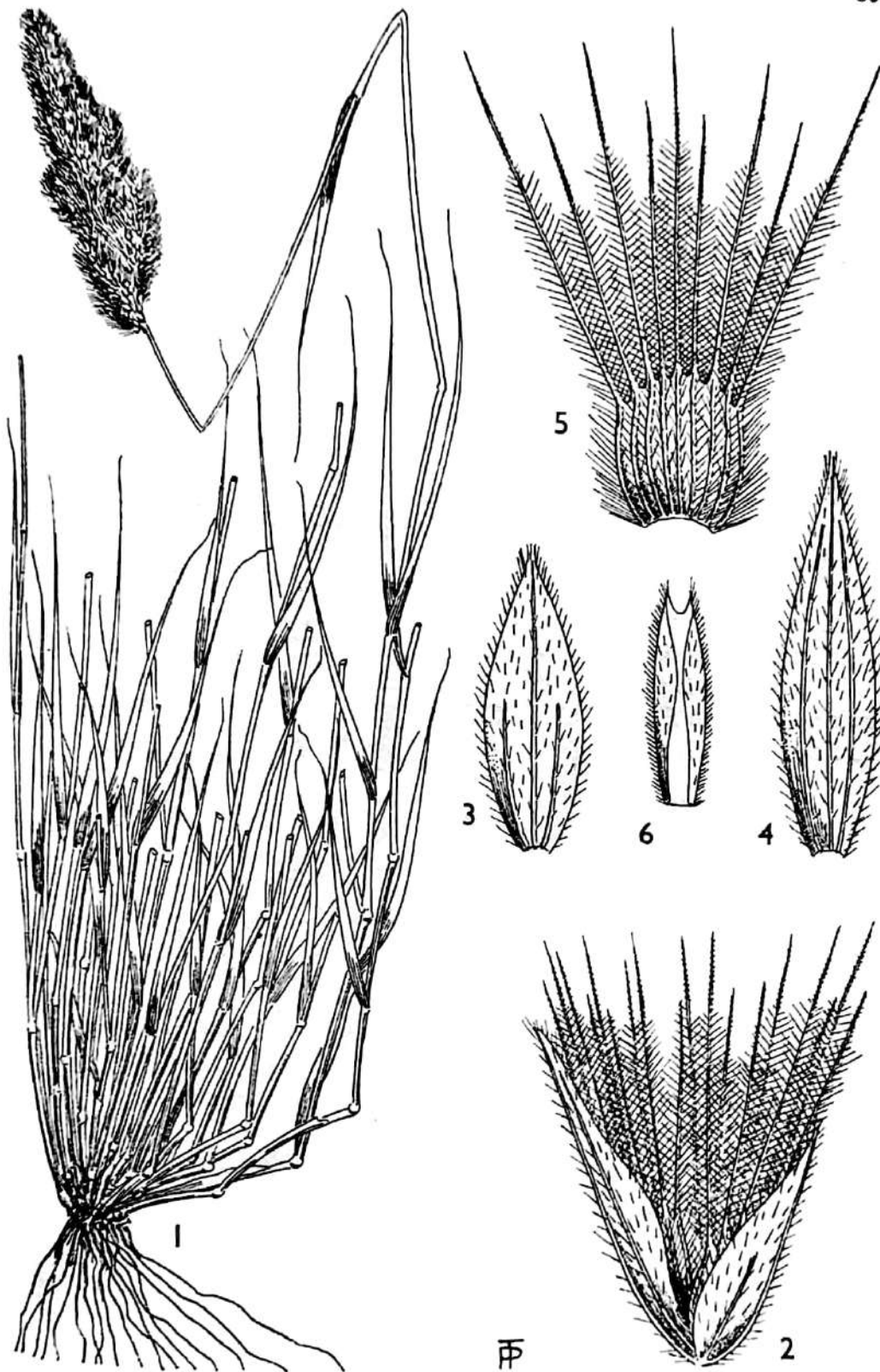


Fig. 71. *Enneapogon cenchroides* (Licht.) C. E. Hubb.
 1, plant $\times \frac{2}{3}$; 2, spikelet; 3, lower glume; 4, upper glume; 5, lemma; 6, palea,
 all $\times 12$.

POOIDEAE—PEROTIDEAE

PEROTIDEAE C. E. Hubbard*

Spikelets all alike, hermaphrodite, 1-flowered; rhachilla articulate below the glumes so that the spikelets fall entire, not produced beyond the floret. Glumes subequal, 1-nerved, acuminate, ending in long capillary awns; lemmas hyaline, much shorter than the glumes, awnless; palea hyaline, 2-nerved, minute. Lodicules 2, cuneate, short, hyaline. Stamens 3. Ovary glabrous; styles 2, shortly connate; stigmas short. Grain linear, terete, as long as the glumes and free within them; embryo one-third the length of the grain; hilum punctiform, basal. Starch-grains compound and simple.

Annual or perennial herbs. Leaf-blades flat, ovate-cordate, broad, with panicoid anatomy; silica-cells dumb-bell-shaped; micro-hairs 2-celled, with hemispherical distal cells; ligules membranous, ciliate. Spikelets arranged in simple terminal, spike-like racemes.

Chromosomes small; basic number 9(?) or 10.

Genus: *Perotis*

Perotis Ait., Hort. Kew. ed. 1, 1, 85 (1789).

Xystidium Trin., Fund. Agrost. 102 (1820).

Key to the species of *Perotis*

1. Glumes with loosely scattered hairs on the dorsal surface; callus definite; found in South India and Ceylon *P. indica*
1. Glumes with definite lines of hairs on the dorsal surface; callus obsolete; found in the Himalaya, Eastern India and Burma *P. hordeiformis*
1. *Perotis hordeiformis* Nees apud Hook. et Arn., Bot. Beech. Voy. 247, 248 (1838).
P. glabrata Steud., Syn. Pl. Glum. 1, 186 (1854).
P. birmanica Gandg. in Bull. Soc. Bot. France 66, 301 (1920) in clavi.
 Distribution: Northwest India, east and south-eastwards to Southeast Asia and on to Formosa.
 Exsicc.—Griffith 103, Baluchistan; J. S. Gamble 23369, Dehra Dun; C. B. Clarke 27213E, Darjeeling; J. H. Lace 4336, Maymyo, Burma.
- ✓ 2. *Perotis indica* (Linn.) O. Ktze., Rev. Gen. Pl. 2, 787 (1891).
Anthoxanthum indicum Linn., Sp. Pl. ed. 1, 28 (1753).
Saccharum spicatum Linn., loc. cit. 54.
Perotis latifolia Ait., Hort. Kew. 1, 85 (1789).
P. patula Nees apud. Hook. et Arn., Bot. Beech. Voy. 247, 248 (1838) non Nees ex Trin. (1841).

*See Appendix page 686.



Fig. 72. *Perotis indica* (Linn.) O. Ktze.
Plant $\times \frac{1}{2}$. 1, spikelet $\times 4$.

POOIDEAE—PHAENOSPERMEAE

PHAENOSPERMEAE *Roshevitz*, *Gräser* 149, 242 (1937)

Spikelets all alike, 1-flowered, hermaphrodite, falling entire from the pedicels. Lower glume membranous, less than half the length of the spikelet, 1-3-nerved; upper glume membranous to scarious and hyaline on the margins, about the length of the spikelet, 3-5-nerved, the two lateral being very short; lemma the length of the spikelet, strongly 3-5-nerved, scarious on the margins; palea broadly ovate-elliptic, of similar texture, strongly 2-keeled, deeply furrowed between the keels and with broad flaps, splitting when the fruit is mature. Lodicules 3, the adaxial one adjacent to the ventral surface of the palea, ovate-acute, glabrous. Stamens 3; anthers large; filaments short. Ovary glabrous; styles 2; stigmas 2, plumose. Grain globose, loosely enclosed between the widely gaping lemma and palea, with a crustaceous sculptured testa; hilum the whole length of the grain; endosperm ruminant; embryo very small, basal; starch-grains simple, angular.

Perennial herbs with broad acuminate tessellately-nerved leaves tapering to the base; petiole twisted at the base so that the abaxial surface of the leaf faces upwards; anatomy festucoid; silica-cells elliptic or more or less crescent-shaped; 2-celled micro-hairs absent; ligules membranous. Spikelets deciduous as a whole from the short pedicels on the scabrid spreading verticillate branches of large terminal panicles.

Chromosomes small; basic number 12.

Genus: Phaenosperma

***Phaenosperma* Munro ex Benth. et Hook. f.,**
Gen. Pl. 3, 1119 (1883).

1. ***Phaenosperma globosum* Munro ex Oliver in Hook., Ic. Pl. sub tab. 1991 (1891).**

Distribution: China, Sikkim, Bhutan, Assam, South Tibet.

A robust grass, 2-3 mm tall, forming tufts or clumps in pine-oak forests.

Exsicc.—*Kingdon-Ward* 13886, Rupa, Balipara Frontier Tract.

POOIDEAE—PHALARIDEAE

PHALARIDEAE Kunth, Rév. Gram. 1, 12 (1829)

Spikelets all similar or sometimes the lower reduced, hermaphrodite, strongly compressed, 3-flowered, with the two lower florets barren and reduced to the lemmas or one or both absent; rhachilla disarticulating above the glumes but not between the florets. Glumes persistent, equal and as long as the spikelet; lower two lemmas small, sometimes reduced to minute scales; fertile lemma becoming indurated, awnless, 5-nerved; palea as long as the lemma, 2-nerved, 2-keeled. Lodicules 2, hyaline. Ovary glabrous; styles 2; stigmas 2, plumose. Stamens 3. Grain closely invested by the indurated lemma and palea; hilum oblong, short; embryo small; starch-grains compound.

Annual or perennial herbs. Leaf-blades narrow with festucoid anatomy and oblong silica-cells; 2-celled micro-hairs absent; ligules membranous. First foliage leaf narrow, erect. Panicles contracted, sometimes spike-like.

Chromosomes large; basic number 6 or 7.

Genus: *Phalaris*

Phalaris Linn., Gen. Pl. ed. 5, 29 (1754) et in
Sp. Pl. ed. 1, 54 (1753).

Key to the species and varieties of *Phalaris*

1. Lower and upper glumes winged; inflorescence contracted:—
 2. Annuals, not swollen at the base:—
 3. Spikelets all of one kind:—
 4. Wing of glumes entire on the margin; sterile lemmas similar
P. canariensis
 4. Wing of the glumes minutely serrate and undulate; sterile lemmas very dissimilar, the lower very minute, the upper about one-third the length of the spikelet:—
 5. Sterile lemmas present *P. minor* var. *minor*
 5. Sterile lemmas minute or absent altogether
P. minor var. *nepalensis*
 3. Spikelets of three kinds, hermaphrodite, sterile and deformed; upper in groups of seven, the centre perfect surrounded by six sterile, the lower reduced, club-shaped
P. paradoxa
P. tuberosa
 2. Perennial, swollen at the rhizomatous base
P. arundinacea
 1. Lower and upper glumes not winged; inflorescence loose; perennial
P. arundinacea
- ✓ 1. **Phalaris arundinacea** Linn., Sp. Pl. ed. 1, 55 (1753).
Arundo colorata Ait., Hort. Kew. 1, 116 (1789).
Typhoides arundinacea (Linn.) Moench, Meth. Pl. 202 (1794).
Calamagrostis variegata With., Bot. Arr. Brit. Pl. ed. 3, 2, 124 (1796).

Arundo riparia Salisb., Prodr. Stirp. 24 (1796).

Digraphis arundinacea (Linn.) Trin., Fund. Agrost. 127 (1820).

Distribution: Widely distributed in the temperate parts of the Northern Hemisphere.

According to Hubbard it is a useful grazing or hay grass when young as it yields a large amount of green matter over a long period. The variety with leaves striped green and cream, var. *picta* Linn., is grown in the gardens of Government House, Shillong, and possibly elsewhere, for ornament. $2n = 14, 28$.

Exsicc.—N. L. Bor and Kiratram 20620, Sikkim; A. H. G. Alston 950, Ceylon.

2. ***Phalaris canariensis* Linn., Sp. Pl. ed. 1, 54 (1753).**

Ph. avicularis Salisb., Prodr. Stirp. 17 (1796).

Distribution: A native of the western Mediterranean Region.

The seeds of this species occur in mixtures of seed for cage-birds and the plant therefore often occurs as a casual, and may even establish itself. $2n = 12$.

3. ***Phalaris minor* Retz., Obs. Bot. 3, 8 (1783).**

Distribution: Mediterranean Region to Baluchistan.

var. **minor**.

Found in fallow fields. $2n = 28$.

Exsicc.—E. Pierce s.n., coast of Baluchistan; Aitchison 220, Afghanistan; Griffith 6468, Afghanistan; Umrao Singh 314, Balupur, Dehra Dun.

✓ var. **nepalensis** (Trin.) Bor, comb. nov.

Phalaris nepalensis Trin., Sp. Gram. Ic. (1828), t. 80.

Distribution: Northwest Himalaya.

This variety is distinguished from the type by one or both lower empty lemmas being completely absent or very much reduced or rarely only one present and the other absent or reduced.

Exsicc.—Jacquemont 602, Garhwal; Royle s.n., northwest India.

4. ***Phalaris paradoxa* Linn., Sp. Pl. ed. 2, 1665 (1763).**

Distribution: Native in the Mediterranean Region, extending as a casual to northwest India.

Exsicc.—Griffith 6470, Afghanistan; Harbhajan Singh s.n., Quetta. The latter sheet is in the Forest Research Institute Herbarium, Dehra Dun.

5. ***Phalaris tuberosa* Linn., Mantissa 2, 557 (1771).**

Distribution: Native in the Mediterranean Region but cultivated in Australia and also in India.

It is a valuable pasture grass. $2n = 28$.

Note. A highly fertile allopolyploid of the cross *P. minor* × *P. tuberosa* with the highest chromosome number recorded in the genus ($2n = 56$) has recently been synthesized in Australia. It has been described as *Phalaris daviesii* S. T. Blake. It is distinguished by a very long ligule (6–10 mm long), relatively large spikelets and tufted perennial habit.

addenda

POOIDEAE—PHAREAE

PHAREAE *Stapf* in Dyer, Fl. Cap. 7, 319 (1898)

Spikelets 1-flowered, unisexual, dissimilar, monoecious. Female spikelets terete, ovoid or conchiform and more or less inflated; glumes present, caducous, ovate-acute, unequal; lemma papery, much longer than the glumes, open down one side or closed except for a pore at the side or top, hence utricle-like, covered with minute hooked hairs; palea very delicate, linear, longer than the lemma-utricle; ovary small, ovoid, gibbous; style 1; stigmas 3, very long. Grain free within the accrescent lemma. Male spikelets smaller than the female; glumes small, ovate, empty, 5-7-nerved, spreading; lemma cymbiform; palea linear-lanceolate; stamens 6; filaments short; anthers long. Grain oblong, more or less compressed with a deep groove on one side in which the long filiform hilum lies; embryo very small, broader than long; starch-grains simple.

Perennial herbs. Leaf-blades flat, broad, obovate or oblanceolate, narrowed to a short petiole-like base, twisted through 180°, many- and tessellately-nerved, with bamboo-like anatomy; silica-cells cross-shaped or dumb-bell-shaped; 2-celled micro-hairs absent; ligule a fringe of hairs. Male and female spikelets in the same panicle, often in a group of few females at the base and male or males terminal on the branchlets.

Genus: *Leptaspis*.

Leptaspis R.Br., Prod. Fl. Nov. Holl. 211 (1810).

Key to the species of *Leptaspis*

1. Utricle 4.5-6 mm long, oblong, curved, deeply longitudinally 5-ribbed-corrugate, covered with crisped hairs terminating in a hook; pore lateral
L. cochleata
1. Utricle 8-9 mm long, turbinate, flat on the top, not ridged, but indistinctly ribbed, covered all over with crisped hooked hairs; pore terminal.
L. urceolata
1. *Leptaspis cochleata* Thw., Enum. Pl. Zeyl. 357 (1864).
L. conchifera Hack. in Bolet. Soc. Brot. 5, 211 (1887), t. 9, f.A.
L. comorensis A. Camus in Bull. Mus. Hist. Nat. Paris 30, 513 (1924).

Distribution: Ceylon to Tropical Africa and Madagascar.

A forest grass.

Exsicc.—*Thwaites* C.P. 972, Ceylon.

2. *Leptaspis urceolata* (Roxb.) R.Br. in Benn., Pl. Jav. Rar. 23 (1838), t. 6.

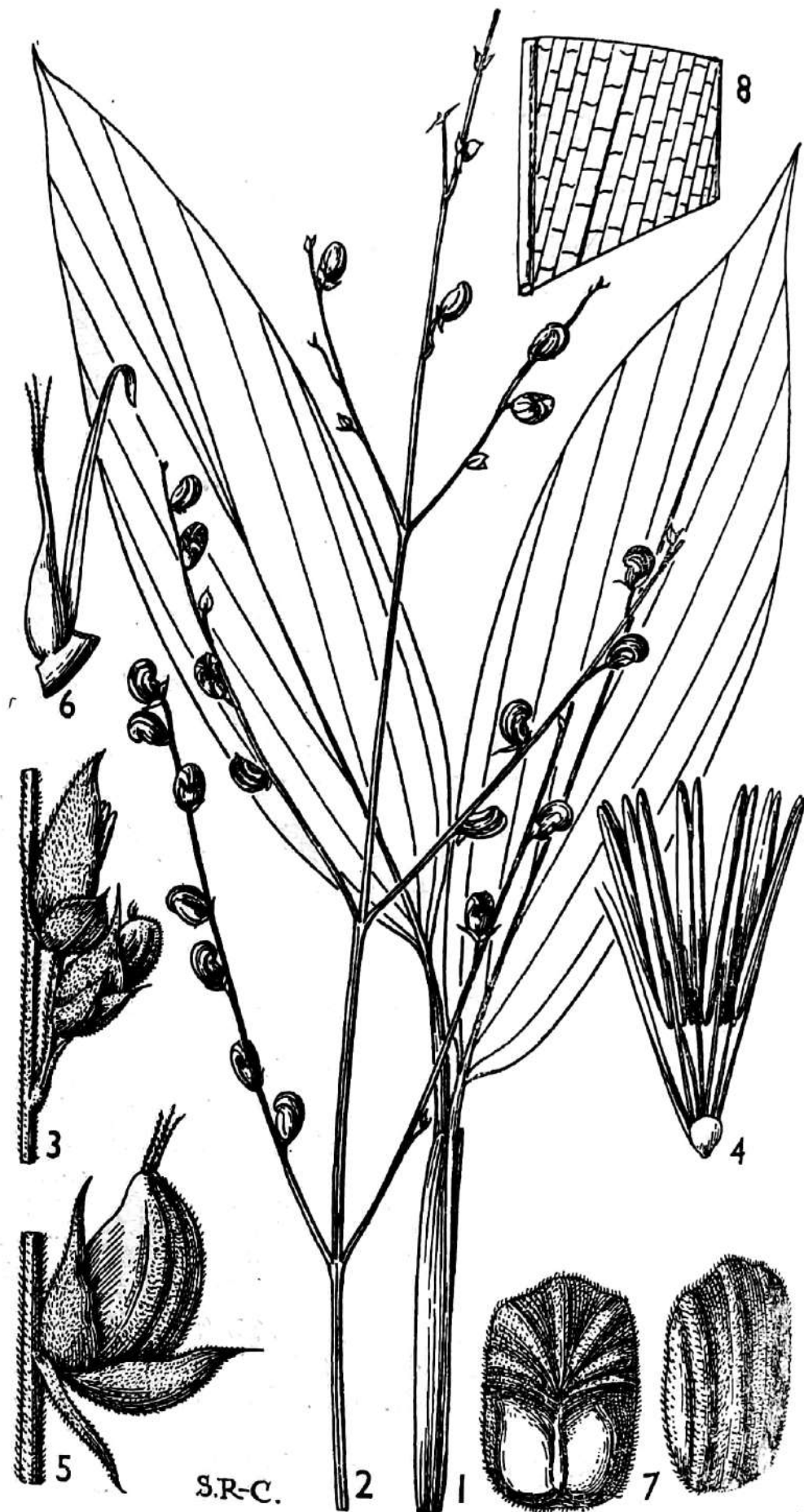


Fig. 73. *Leptaspis cochleata* Thw.
 1, leafy shoot; 2, inflorescence $\times \frac{2}{3}$; 3, pair of spikelets $\times 3$; 4, male flower $\times 10$;
 5, female spikelet; 6, pistil; 7, lemmas; 8, part of leaf-blade showing nervation;
 all $\times 5$.

POOIDEAE—POMMEREULLEAE

POMMEREULLEAE N. L. Bor*

Spikelets turbinate, 2-3-flowered, hermaphrodite, the hermaphrodite florets enclosed by the one or two empty lemmas; rhachilla jointed above the glumes, stout, obconical, callus-like, continuous between the florets, produced and crowned at the tip by an imperfect floret. Glumes persistent, narrow or panduriform, broadly hyaline on the margins, the lower 1-nerved, the upper 3-nerved. Empty lemmas broadly elliptic in outline, contracted at the base, tomentose, 4-lobed, 7-9-nerved, awned from the back, nerves in the lobes occasionally produced as awns; fertile lemmas 3-lobed by fusion of 2 inner lobes, awned on the back, coriaceous in texture; palea 2-nerved; nerves wide apart. Stamens 2-3; styles 2; stigmata plumose. Lodicules 2, membranous. Grain obovate-elliptic; embryo three-quarters the length of the grain; hilum punctiform.

A stout perennial creeping by means of wiry stolons; leaves strap-shaped with panicoid anatomy; silica-cells saddle-shaped; ligule a ciliate ridge; hairs swollen, 2-celled. Inflorescence a raceme usually half enclosed in the uppermost leaf-sheath.

Genus: Pommereulla.

Pommereulla Linn. f., Diss. Nov. Gram. 31 (1779).

1. **Pommereulla cornucopiae** Linn. f., Diss. Nov. Gram. 31 (1779).
Distribution: South India and Ceylon.

This stout perennial grass spreads widely by means of its woody stolons. In Madras it is said to grow in gravelly and somewhat alkaline soils.
Exsicc.—Bourne 3160, Madras; Wallich 8904, Madras.

* See Appendix page 686.

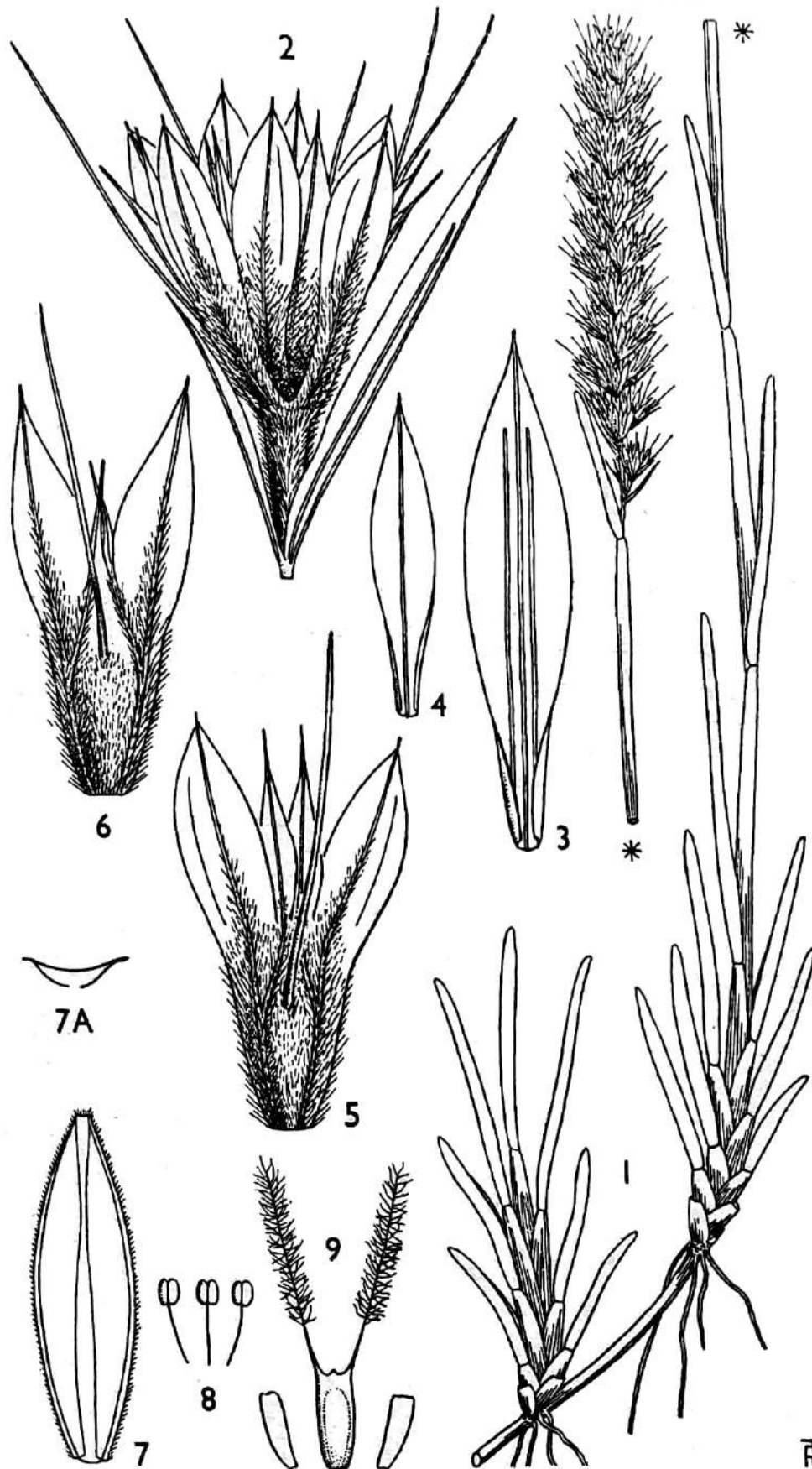


Fig. 74. *Pommereulla cornucopiae* Linn. f.
 1, plant $\times 1$; 2, spikelet $\times 6$; 3, upper glume $\times 6$; 4, lower glume $\times 6$; 5, sterile lemma $\times 8$; 6, fertile lemma $\times 8$; 7, palea $\times 12$; 7a, section of palea; 8, stamens; 9, ovary and lodicules $\times 12$.

POOIDEAE—SPOROBOLAEAE

SPOROBOLAEAE Stapf in Dyer, Fl. Cap. 7, 315 (1898)

Spikelets all alike, hermaphrodite, terete, gaping, 1-flowered, small; rachilla disarticulating above the glumes, very rarely produced beyond the floret. Glumes membranaceous, nerveless or 1-nerved, usually shorter than the lemmas, equal or unequal, truncate, acute or acuminate, more or less persistent; lemmas 1-3-nerved, membranous not becoming indurated, usually shining, mostly greyish; palea hyaline, 2-nerved, often split by the developing grain. Lodicules 2, broadly cuneate, glabrous. Stamens 2 or 3. Ovary glabrous; styles 2, free; stigmas plumose. Grain enclosed in a delicate pericarp which swells when wetted and often ejects the seed; hilum small, punctiform, basal; embryo half as long or as long as the grain; starch-grains compound.

Annual or perennial herbs. Leaf-blades narrow with panicoid anatomy; silica-cells saddle-shaped; micro-hairs 1-celled occasionally 2-celled, swollen; ligule a line of hairs which are sometimes connate at the base. First leaf-blade of the seedling spreading. Inflorescence an open or contracted panicle of usually very small spikelets.

Chromosomes small; basal number 9, 10 (12).

Genera: Crypsis

Sporobolus

Urochondra

Key to the genera of **Sporoboleae**

1. Inflorescence spicate, very dense, subtended by an inflated sheath bearing a rudimentary blade **Crypsis**
1. Inflorescence a spreading panicle, or spike-like and elongate; no inflated sheath:—
2. Inflorescence elongate, spike-like; fruit with a conspicuous beak **Urochondra**
2. Inflorescence a panicle (spike-like in *S. spicatus*); fruit without a beak **Sporobolus**

Crypsis Ait., Hort. Kew. ed. 1, 1, 48 (1789) nomen genericum conservandum.

Pallasia Scop., Introd. 72 (1777).

Antitragus Gaertn., Fruct. 2, 7 (1790), t. 80.

Heleochoa Host, Ic. Gram. Austr. 1, 23, (1801) tt. 29, 30.

Peacha Pourr. ex Lapeyr., Suppl. Pl. Pyr. 8 (1818).

Torgesia Bornm. in Mitteil. Thüring. Bot. Ver. n.s. 30, 83 (1913), t. 1, f.3.

1. **Crypsis schoenoides** (Linn.) Lamk., Tab. Encycl. Meth. Bot. 1, 166 (1791), t. 42.

Phleum schoenoides Linn. Sp. Pl. ed. 1, 60 (1753).

Heleochloa schoenoides (Linn.) Host, Icon. Gram. Austr. 1, 23 (1801), t. 30.

Distribution: Northwest India (hills and plains), Afghanistan westwards to Mediterranean Region and East Africa.

A plant of great variability, those in the desert depauperate with reduced leaves and stems and inflorescence hardly exerted from the leaf-sheaths—those in more favourable habitats, by comparison luxuriant, simulating *Alopecurus* in appearance.

Exsicc.—Aitchison 695, Afghanistan; J. R. Drummond 21223, Punjab.

Sporobolus R.Br., Prod. Fl. Nov. Holl. 169 (1810).

Cryptostachys Steud., Syn. Pl. Glum. 1, 181 (1854).

Vilfa P. Beauv., Ess. Agrost. 16 (1812), t. 5, f.8.

Key to the species of *Sporobolus*

1. Lower glume much shorter than the lemma, rarely two-thirds as long:—
2. Upper glume distinctly shorter than the lemma (i.e. less than three-quarters as long), lowest branches not truly whorled:—
3. Panicle effuse, at least at maturity:—
4. Lemmas 1.5 mm long or longer:—
 5. Spikelets 2 mm long, scattered; upper glume half the length of the spikelet or more; lower glume narrow, acuminate; branches alternate, up to 6 cm long; panicle up to 15 cm long, up to 8 cm wide; stamens 3 *S. stocksii*
 5. Spikelets hardly 1.75 mm long or if about 2 mm long then the panicles much longer than 15 cm long and branches spiculate to the base and branched:—
 6. Spikelets rather crowded, slatey-grey in colour; lower glume truncate; upper often acute; panicles up to 20 cm long, 4–5 cm wide; stamens 2 *S. diander*
 6. Spikelets rather scattered; lower glume very short, obtuse; panicle up to 45 cm long by 20 cm wide; tall grasses with long leaves; stamens 3 *S. wallichii*
4. Lemmas 1 mm long or less; stamens 3 *S. tenuissimus*
3. Panicle contracted:—
 7. Panicle cylindric; spikelets crowded; stamens 3 *S. spicatus*
 7. Panicle subspiciform, often interrupted, up to 2.5 cm wide:—
 8. Lower glume one-half to two-thirds the length of the spikelet; stamens 2 *S. indicus*
 8. Lower glume half or less than half the length of the spikelet; stamens 3; panicle-branches spiculate to the base:—
 9. Spikelets not more than 2.1 mm long, usually under 2 mm *S. indicus*
 9. Spikelets turgid, 2.5–2.75 mm long *S. africanus*

2. Upper glume as long, nearly as long as or longer than the lemma; lowest branches whorled or not:—
10. Panicle contracted; lower branches not truly whorled:—
 12. Perennials; stamens 3:—
 13. Spikelets 1.5–1.75 mm long; lower glume lanceolate, about 1 mm long; leaf-margins smooth *S. tremulus*
 13. Spikelets 2 mm long; lower glume about 0.5 mm long, rounded at tip; stoloniferous; anthers 1 mm long; leaf-margins spinulose *S. maderaspatanus*
 12. Annual; stamens 2; spikelets 1.25–1.5 mm long *S. piliferus*
10. Panicle effuse, spreading, at least at maturity; lower branches truly whorled:—
 14. Annuals:—
 15. Lower glume minute, less than half the length of the lemma; panicle pyramidal, 6.5 cm long; spikelets minute, just over 1 mm long (1.25 mm), crowded on the distal end of the branch; stamens 3; anthers 0.5 mm long; grain obovate *S. coromandelianus*
 15. Lower glume at least half as long as the lemma; grain ellipsoid or discoid:—
 16. Upper glume just exceeding lemma in length; stamens 3; grain discoid *S. capillaris*
 16. Upper glume just equal to or shorter than the lemma; grain ellipsoid, biconvex or 4-angled:—
 17. Grains quadrangular in section:—
 18. Panicle-branches naked in lower half or two-thirds or more, 2.5–5 cm long; pedicels 1–1.5 mm long *S. tetragonus*
 18. Panicle-branches naked in lower third, horizontal, 1 cm long; pedicels 0.5 mm long *S. collettii*
 17. Grains lenticular in section *S. harmandii*
 14. Perennials:—
 19. Plants with stout, prostrate, woody stolons; spikelets 2.1–2.4 mm long; roots stout, often covered with minute sand particles *S. marginatus*
 19. Plants without woody stolons, densely tufted:—
 20. Panicles widely spreading:—
 21. Branches widely spreading; spikelets not very densely arranged *S. airoides*
 21. Branches stiffly ascending; spikelets densely arranged *S. wrightii*
 20. Panicles rather narrow, several to many times as long as broad (rather similar to that of *S. diander*) *S. fimbriatus*
 1. Lower glume as long as the spikelet or at least three-quarters its length; leaf-margins smooth:—

22. Spikelets 2–2.5 mm long, pale; basal leaves pungent; stamens 3, 1.5 mm long; ligule of long hairs *S. virginicus*
22. Spikelets 1–1.5 mm long, glaucous; basal leaves glaucous, rather lax, not pungent; stamens 3; anthers 0.75–0.8 mm long; ligule almost absent *S. helvolus*

The caryopses in the genus *Sporobolus*.

In this genus the grains are loosely or firmly enclosed in a gelatinous pericarp. When wetted the pericarp swells and, if it be loosely attached, turns inside out and ejects the seed, which remains attached to the lemma. In this condition the seeds are sticky and adhere to the fur of passing animals and so are distributed. The seeds themselves are usually red in colour and may be smooth, or more often coarsely pitted or sculptured on the surface. When ripe they are extremely uniform in shape for each species, and vary very little in size. They are therefore important for the separation of the species in this difficult genus. The grains of the Indian species are all known except for one species, and the following is an outline of the groups into which the species fall. The measurements are "longitudinal axis \times transverse axis".

1. Discoideae

In this group the seeds are discoid in shape, exactly like a millstone.

S. capillaris Miq.

0.7 \times 0.6 mm, flattened and smooth on both surfaces.

S. fimbriatus Nees

1.0 \times 0.7 mm, rather thick, somewhat flattened at the apex, rough on the surfaces; pericarp eventually loose.

2. Truncatae

The seeds are truncate above, oblong or elliptic-oblong in outline, wedge-shaped or compressed in section.

S. diander (Retz.) P. Beauv.

0.6 \times 0.5–0.4 mm, compressed, flattened, rather coarsely pitted on the surface; pericarp adherent.

S. indicus auctt. non (Linn.) R.Br.

1.1–1.25 \times 0.5–0.6 mm, compressed, wedge-shaped in section, rather coarsely pitted on the surface; pericarp closely adherent.

S. tenuissimus (Schrank) O. Ktze.

0.6–0.5 mm, compressed, wedge-shaped in section, coarsely pitted on the surface; pericarp adherent.

S. wallichii Munro

1.0 \times 0.7 mm, compressed, flat on the surfaces, rather coarsely pitted; pericarp loose.

3. Obovatae

The grains are typically obovate in outline, but in section they are lenticular or elliptic or compressed and wider on one side than on the other.

- S. coromandelianus* (Retz.) Kunth
 0.75×0.5 mm, triangular in section, surfaces somewhat convex, smooth, coarsely and irregularly shallowly furrowed; pericarp loose.
- S. marginatus* Hochst. ex A. Rich.
 0.8×0.6 mm, narrowly wedge-shaped, slightly convex on the surfaces; embryo half the length of the grain; pericarp loose.
- S. orientalis* (Nees) Kunth
 0.9×0.5 mm, lenticular in section, shallowly furrowed on the surface; pericarp not very loose.
- S. indicus* Stapf
 0.7×0.4 mm, lenticular or wedge-shaped in section; pericarp very loose.
- S. spicatus* (Vahl) Kunth
 0.6×0.4 mm, in section lenticular, shallowly furrowed on the slightly convex surfaces; pericarp somewhat loose.
- S. tremulus* (Willd.) Kunth
 0.8×0.4 mm, triangular in section with slightly convex surfaces; embryo more than half the length of the grain; basal scar large; pericarp rather loose.
- S. maderaspatanus* Bor
 0.9×0.5 mm, lenticular in section, very shallowly furrowed on the surfaces; basal scar large; pericarp not very loose.
- S. virginicus* (Linn.) Kunth
 1.2×0.8 mm, broadly obovate-elliptic in outline, broadly elliptic in section, with shallow depressions on the surface; embryo half the length of the grain; pericarp closely adherent.

4. Ellipticae

Seeds globose or elliptic in outline, lenticular or elliptic in section.

S. piliferus (Trin.) Kunth

1.1×0.6 mm, surfaces shallowly furrowed; embryo one-third the length of the grain; pericarp closely adherent.

S. helvolus (Trin.) Th. Dur. et Schinz

0.5×0.3 mm, surface shallowly furrowed; embryo short; pericarp adherent.

S. harmandii Henr.

1.0×0.5 mm, elliptic in outline, lenticular in section, striate on the surface; embryo one-third the length of the grain; pericarp rather tight.

S. airoides (Torr.) Torr.

1.0×0.6 mm, elliptic in outline and in section; pericarp tight.

S. wrightii Munro

1.3×0.5 mm, oblong-elliptic, somewhat tapered at both ends, lenticular in section; pericarp rather tight.

5. Tetragonae

Seeds four-angled in section.

S. tetragonus Bor

0.6×0.5 mm, elliptic in outline, 4-angled, pitted on the surface; pericarp firmly attached to base and apex.

S. collettii (Hook. f.) Bor

0.6×0.6 mm, almost globose in shape, 4-angled, almost square in section, pitted on the surface; pericarp loose.

Seeds unknown

S. stocksii Bor

1. ***Sporobolus africanus* (Poir.) Robyns et Tourn.** in Bull. Jard. Bot. Etat. Brux. 25, 242 (1955).

Agrostis spicatus Thunb., Prod. Pl. Cap. 19 (1794) non Vahl (1790).

A. capensis Willd., Sp. Pl. ed. 4, 1, 372 (1798) non (Linn.) Lamk. (1783) nec Steud. (1829).

A. africana Poir. in Lamk., Encycl. Meth. Bot., Suppl. 1, 254 (1810).

Vilfa capensis (Willd.) P. Beauv., Ess. Agrost. 16, 147, 181 (1812).

Sporobolus capensis (Willd.) Kunth, Enum. Pl. 1, 212 (1833).

Distribution: East and South Africa, sometimes introduced elsewhere.

The two specimens cited are apparently this species.

Exsicc.—F. Ballard 1170, 1225, Ceylon. $2n = 18, 36$.

2. ***Sporobolus airoides* (Torr.) Torr.**, U.S. Rpt. Expl. Miss. Pacif. 7, 21 (1856).

Agrostis airoides Torr. in Ann. Lyc. N.Y. 1, 151 (1824).

Vilfa airoides (Torr.) Trin. ex Steud., Nom. Bot. ed. 2, 2, 766 (1841).

Sporobolus diffusissimus Buckl., in Proc. Acad. Nat. Sci. Phil. 1862, 90 (1862).

Distribution: Found in alkaline regions in the United States; introduced into India. It is considered to be an excellent forage grass. $2n = 108, 126$.

- ✓ 3. ***Sporobolus capillaris* Miq.** in Verh. Konink. Nederl. Inst. 3, 4, 37 (1851).

Sporobolus scabrifolius Bhide in J. and Proc. Asiat. Soc. Beng. n.s., 8, 312 (1912).

Distribution: Bombay, Madras and Burma.

Exsicc.—J. F. Duthie 10030, Madhya Pradesh; W. A. Talbot 2176, Bombay.

4. ***Sporobolus collettii* (Hook. f.) Bor** in Kew Bull. 1954, 502 (1955).
S. coromandelianus Kunth var. *collettii* Hook. f., Fl. Brit. Ind. 7, 253 (1896).

Distribution: Endemic in Burma.

This species is only known from the type collection.

Exsicc.—H. Collett s.n., Meiktila, Burma.

- ✓ 5. ***Sporobolus coromandelianus* (Retz.) Kunth**, Rév. Gram. 1, 68 (1829).

Agrostis coromandeliana Retz., Obs. Bot. 4, 19 (1786).

Vilfa coromandeliana (Retz.) P. Beauv., Ess. Agrost. 16, 147 (1812).



Fig. 75. *Sporobolus collettii* Bor
 1, plant $\times 1$; 2, single spikelet; 3, lower glume; 4, upper glume; 5, lemma; 6, palea; 7, ovary; 8, stamen; 9, lodicules; all $\times 20$.



Fig. 76. *Sporobolus indicus* auctt. non (Linn.) R.Br.
 Plant $\times \frac{1}{2}$. 1, ligule; 2, portion of branch with spikelet $\times 8$; 3, spikelet; 4, lower glume; 5, upper glume; 6, lemma; 7, palea; all $\times 12$.

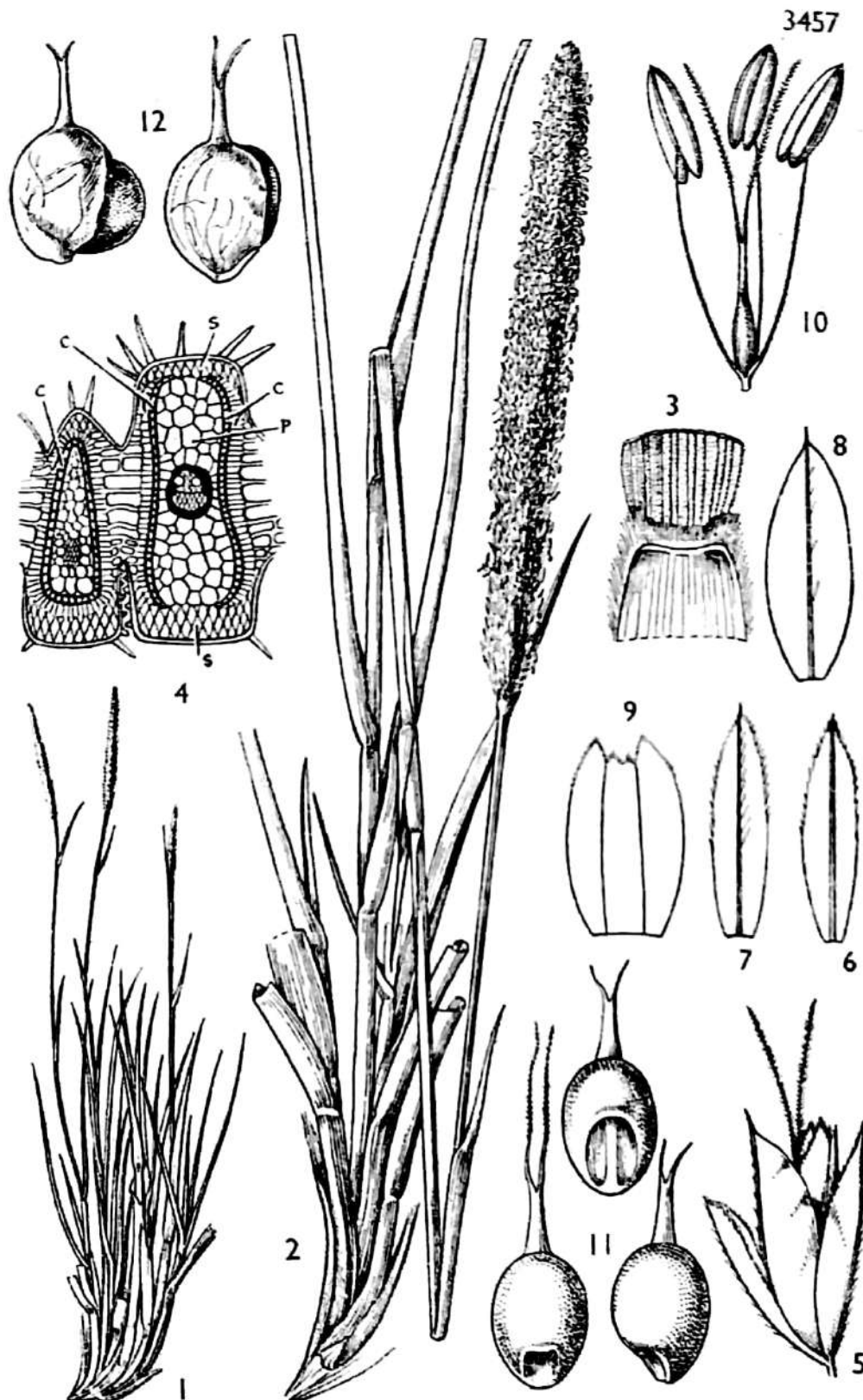


Fig. 77. *Urochondra setulosa* (Trin.) C. E. Hubbard
 1, habit figure $\times \frac{1}{4}$; 2, part of plant, natural size; 3, ligule; 4, transverse section of part of leaf-blade, diagrammatic, much enlarged (c = chlorenchyma, p = parenchyma, s = sclerenchyma); 5, spikelet $\times 16$; 6, lower glume; 7, upper glume; 8, lemma; 9, palea; 10, flower, all $\times 16$; 11, grains $\times 24$; 12, two views of grains showing liberation of seed from the pericarp.

POOIDEAE—STIPEAE

STIPEAE Dumort., Obs. Gram. Belg. 83, 139 (1824)

Spikelets all alike, hermaphrodite, 1-flowered; rhachilla disarticulating above the glumes, not prolonged beyond the floret. Glumes persistent, of a much more delicate texture than the lemma and palea, longer than the lemma, 1-3-nerved; lemma terete becoming slightly or strongly indurated at maturity, with convolute or involute margins, 5-7-nerved with nerves close together at the apex, often with a bearded, sharp or obtuse callus, awned from the entire or minutely 2-lobed tip or rarely the lobes produced into stout scabrid bristles; awn simple, continuous with or articulated to the tip of the lemma, bent or geniculate, twisted below, plumose or naked above the knee; palea of similar texture to the lemma, 2-keeled, 2-nerved. Lodicules 3. Stamens 3. Caryopsis tightly embraced by the lemma and palea; hilum linear, almost the length of the grain or shorter; embryo short.

Annual or perennial herbs often inhabiting very dry inhospitable localities. Leaf-blades narrow, often rolled, with the chlorenchyma evenly distributed between the vascular bundles; silica-cells simple, variable; 2-celled micro-hairs present, elongated; ligule membranous to scarious. First foliage leaf of the seedling narrow and erect. Inflorescence of spikelets arranged in open or contracted panicles.

Chromosomes small; basic number 7-13 and 17.

Genera: *Oryzopsis*

Stipa

Trikeria

Key to the genera of Stipeae

1. Lemma, if bifid, with acute lobes:—
 2. Lemma narrowly linear, long, slender; awn kneed, usually twisted below; callus long and sharp pointed; lodicules 3, large **Stipa**
 2. Lemmas elliptic, plump; awn eventually deciduous; not twisted but curved; callus short, obtuse, never long and pointed **Oryzopsis**
1. Lemma bifid with the lobes produced into two stout scabrid bristles; lodicules 3, large **Trikeria**

Oryzopsis Michx., Fl. Bor. Amer. 1, 51 (1803), t. 9.

Piptatherum P. Beauv., Ess. Agrost. 17 (1812),
t. 5, f. 10, 11.

Eriocoma Nutt., Gen. Am. 1, 40 (1818).

Urachne Trin., Fund. Agrost. 109 (1820).

Fendleria Steud., Syn. Pl. Glum. 1, 419 (1855).

Key to the species of *Oryzopsis*

1. Lemma orbicular-elliptic in outline, covered with white hairs up to 4 mm long ***O. hymenoides***

1. Lemmas narrower and more elliptic, if covered wholly or partially with hairs, the hairs very much shorter, less than 1 mm long:—
2. Ligule short (less than 1 mm) or completely absent
O. virescens
2. Ligule at least several millimetres long:—
3. Spikelets densely glomerate at the tips of the widely spreading (5–10 cm long) branches; glumes equal 8–9 mm; lemma 6 mm long, golden-hairy; a very robust grass
O. fasciculata
3. Spikelets not densely glomerate at the tips of the branches:—
4. Branches of the panicle long, widely spreading, 7–10 cm long; spikelets many, collected above the middle of the branches but not densely glomerate:—
5. Fruit longer than half the length of the glumes; leaves flat:—
6. Glumes and lemma about equal in length, the latter if anything slightly shorter; spikelets narrowly elliptic-acuminate 6.5–7 mm long; ligule about 4 mm long; fruit finally blackish brown, elliptic-acuminate, covered all over the back with short hairs
O. aequiglumis
6. Glumes decidedly longer than the lemma; glumes 6–7 mm long, broadly elliptic-acuminate; lemma 4–5.5 mm long, elliptic-acute, brown, covered on sides and back above with golden hairs
O. munroi
5. Fruit about half the length of the glumes; glumes 6–7.5 mm long; lemma glabrous, broadly elliptic-acute, 2.5–3 mm long, shining, brown
O. microcarpa
4. Branches of the panicle short, erect, not widely spreading, or if widely spreading, panicle few-spiculate:—
7. Panicle erect, not nodding:—
8. Branches of the panicle widely spreading, over 4 cm long, few-spiculate; spikelets 6.5 mm long; lemma 3–3.5 mm long, lanceolate; plants very glaucous; leaves convolute, pungent
O. wendelboi
8. Branches of the panicle erect, about 2.5 cm long:—
9. Spikelets 4 mm long, broadly elliptic-acute in shape; lemma 3 mm long
O. humilis
9. Spikelets 5 mm long or more:—
10. Spikelets 8 mm long or more:—
11. Spikelets 9–10 mm long; tips of the lanceolate-acute glumes suffused with purple; lemma 6 mm long, covered on the sides and at the tip with short woolly yellowish hairs
O. molinioides
11. Spikelets 7–9.5 mm long; glumes acuminate, almost tailed, not suffused with purple; lemma 5.5 mm long, shortly pilose with greyish hairs
O. brachyclada
10. Spikelets not more than 7.5 mm long:—
12. Leaves filiform, very glaucous, setaceous, numerous

at the base of the plant; glumes 5–6 mm long, lemma 3.5 mm long, covered all over back and sides with a grey pubescence *O. gracilis*

12. Leaves not filiform, green, flat, not collected at the base of the plants; glumes 5–6.5 mm long; lemma 3.5–4 mm long, covered on the sides and on the back above with a short pubescence *O. lateralis*

7. Panicle nodding; glumes 4–4.5 mm long, pale; lemma 3 mm long, covered on back and sides with silky hairs

1. *Oryzopsis aequilum* Duthie, ~~Grass. N.W. India~~ 27 (1883). ^{exc Hk. f., Fl. Brit. India 7:234 (1836)} *O. stewartiana*

see addenda

Distribution: Northwest Himalaya from Tehri Garhwal, westwards.

A robust grass with broad leaves.

Exsicc.—*J. F. Duthie* 15143, Jaunsar; *H. H. Rich* 876, Simla; *W. Koelz* 22100, Tehri Garhwal.

2. *Oryzopsis brachyclada* Pilger in Notizbl. Bot. Gart. Berlin 14, 345 (1939).

Distribution: Northwest India.

The type of Pilger's species was destroyed during the Second World War. Koelz 2612, collected on a dry rock slope at Stag in Ladak, agrees with the description and has been selected as the neotype.

3. *Oryzopsis fasciculata* Hack. in Öst. Bot. Z. 52, 10 (1902).

Piptatherum fasciculatum (Hack.) Roshev. in Not. Syst. Herb. Inst. Bot. Acad. Sci. U.S.S.R. 14, 114 (1951).

Distribution: Northwest India.

Possibly only a form of *O. munroi* Stapf, but it looks different.

Exsicc.—*J. F. Duthie* 12644, northwest India.

4. *Oryzopsis gracilis* (Mez) Pilger in Notizbl. Bot. Gart. Berlin 14, 347 (1939).

Piptatherum gracile Mez in Fedde, Rep. Sp. Nov. 17, 211 (1921).

Distribution: Northwest India, Nepal.

Exsicc.—*T. Thom.* s.n., Kunawar (neotype); *J. F. Duthie* 12031, Baltistan; *Stainton, Sykes and Williams* 5659, Nepal.

5. *Oryzopsis humilis* Bor in Kew Bull. 1951, 445 (1952).

Distribution: Northwest Himalaya (Deoban above Chakrata).

Apparently growing on very rocky slopes.

Exsicc.—*J. F. Duthie* 19850, Deoban.

6. *Oryzopsis hymenoides* (Roem. et Schult.) Ricker ex Piper in Contrib. U.S. Nat. Herb. 11, 109 (1906).

Stipa membranacea Pursh, Fl. Amer. Sept. 2, 728 (1814) non Linn. (1753).

S. hymenoides Roem. et Schult., Syst. Veg. 2, 339 (1817).

Eriocoma cuspidata Nutt., Gen. Pl. 1, 40 (1818).

Exsicc.—*J. F. Duthie* 48, Tehri Garhwal; *C. B. Clarke* 28511, Kashmir;
Lt. Harris 16790, Chitral.

11. ***Oryzopsis stewartiana*** *Bor* in *Kew Bull.* 1953, 272 (1953).

Distribution: Parbatti Valley.

Exsicc.—*Mohinder Nath* 988, Pulga.

12. ***Oryzopsis virescens*** (*Trin.*) *Beck*, *Fl. Nied. Öst.* 1, 51 (1890).

Urachne virescens *Trin.*, *Fund. Agrost.* 110 (1820).

Piptatherum virescens (*Trin.*) *Boiss.*, *Fl. Orient.* 5, 507 (1884).

Distribution: Middle East to Afghanistan.

This species will most probably be found in Baluchistan.

13. ***Oryzopsis wendelboi*** *Bor* in *Nytt Mag. Bot.*, Oslo 1, 16 (1952).

Distribution: Chitral.

Very common about 3300 m.

Exsicc.—*Per Wendelbo* s.n., Barum Gol, Shokor Shal, Chitral.

Note. The species named *Piptatherum barbellatum* by *Mez* in *Fedde, Rep. Sp. Nov.* 17, 211 (1921) may well be *Griffith* 6583, collected in Afghanistan. The lemma is lanceolate in outline with a dense tuft of hairs at the apex. It is closest to *O. molinioides* but the lemma is quite different and it is a good species.

Stipa *Linn.*, *Gen. Pl.* ed. 5, 34 (1754) et in
Sp. Pl. ed. 1, 78 (1753).

Key to the species and varieties of *Stipa*

1. Column of awn twisted:—
2. Awn plumose or hairy throughout its entire length or nearly so:—
3. Glumes purple with hyaline tips:—
4. Spikelets 1–1.5 cm long; awn 6.5–7.5 cm long; anther-tips naked
S. purpurea
4. Spikelets 3–6 mm long; awns not more than 1.5 cm long;
panicles widely spreading; anther-tips bearded:—
6. Lemma hairy all over the dorsal surface; spikelets 3–5 mm
long
S. mongholica
6. Lemma glabrous over most of the dorsal surface, pilose at
base only; spikelets 6 mm long
S. concinna
3. Glumes hyaline or partly hyaline and partly membranous:—
7. Awn 4.5–8 cm long:—
- 7a. Lower glume 1.5 cm long; upper 1.1 cm long; lemma 6 mm
long, spinulose-scabrid below the tip
S. breviflora
- 7a. Lower glume 2.2 cm long; upper 1.5 cm long; lemma 6–8 mm
long, not spinulose-scabrid below the tip
S. orientalis
7. Awn 10–20 cm long; glumes 2.5–3.5 cm long; lemma 10–12 mm
long; hairs on awn 2 mm long
S. szowitsiana

2. Awn plumose above twisted column only, glabrous or very shortly hairy on the column:—
8. Bristle and column 4.5–10 cm long, together shaped like a hand-sickle; hairs on the bristle diminishing in length from base to apex; column shortly hirsute *S. caucasica*
8. Bristle long and flexuous, pinnately pilose; column glabrous; bristle and column together 15–25 cm long *S. himalaica*
2. Awn glabrous or scaberulous throughout or hairy on the column or only at the base:—
9. Tip of the lemma entire:—
10. Awn glabrous throughout its whole length:—
11. Spikelets 2.5–3.5 cm long; lemma 10–12 mm long; awn 15–20 cm long; callus 3–4 mm long *S. capillata*
11. Spikelets 9–11 mm long; lemma 4.5–5.5 mm long; awn 3.5–7 cm long *S. bungeana*
10. Awn hairy on the column or only at the base, or if scabrid throughout, then only 16 mm long:—
12. Leaves convolute-setaceous; panicle erect, narrow, with crowded spikelets; awn hairy below:—
13. Awn 15–25 mm long, very hairy below; spikelets flushed with purple or pale; panicles very narrow, erect:—
14. Glumes 9–14 mm long, acute, hyaline; lower 3–5-nerved; upper 5-nerved; lemma 5–8 mm long, hairy all over; hairs at base of awn 0.5–1 mm long *S. regeliana*
14. Glumes 8–9 mm long, acuminate, purple with hyaline tips; lower 3-nerved; upper 3-nerved; lemma 4–5 mm long, hairy all over; hairs at base of awn 2.5 mm or more long *S. basi-plumosa*
13. Awn 50–100 mm long, slightly hairy or scabrid on the column:—
15. Awn visibly hairy on the column with hairs 1 mm long or a little longer, scabrid on the bristle; glumes 1–2 cm long; lemma 6–7 mm long; annual *S. capensis*
15. Awn scabrid on the column or slightly hairy with hairs 0.5 mm long or shorter; glumes about 2.5 cm long; lemma 8–10 mm long; awns twisted together into a tail *S. consanguinea*
12. Leaves flat; glumes subequal, 8–10 mm long, 3-nerved; lemma as long, hairy on the back; panicle 15–30 cm long, 1–3 cm broad, nodding; awn 16 mm long, hairy at base only or scabrid *S. sibirica*
9. Tip of the lemma 2-fid:—
16. Panicle very large with branches up to 10 cm long, nodding; spikelets purplish; awn 9–10 mm long *S. munroana*
16. Panicle narrow, congested or loose but erect; branches not above 5 cm long:—

17. Panicle elliptic in outline, very congested, up to 9 cm long, 2 cm broad; awns 2 cm long; lower glume 8 mm, the upper 8.5 mm long; lemma 9.5 mm long *S. chitralensis*
17. Panicle loose, erect:—
18. Glumes about 7 mm long; lemma villous, 4.5 mm long; awn 3–4 times as long as the spikelets, geniculate, scabrid and hairy at the very base; callus obtuse, not pointed *S. jacquemontii*
18. Glumes 10–12 mm long; lemma 6–7 mm long, sparsely hairy; awn capillary, about twice as long as the spikelet, kneed, scabrid; callus pointed *S. duthiei*
1. Column of awn not twisted:—
19. Panicle large, spreading, (10) 30–45 cm long; spikelets purplish or pale; lemma 2-fid; no spines at base of awn at tip of lemma; tip of the lemma bifid:—
20. Glumes unequal in length; lower 5 mm, upper 6 mm long; lemma 5 mm long, very hairy:—
21. Panicle 30–50 cm long *S. splendens* var. *splendens*
21. Panicle 10–15 cm long *S. splendens* var. *gracilis*
20. Glumes equal in length, 4–5 mm long; lemma 3–4 mm long *S. caragana*
19. Panicle very narrow, not spreading, 15–25 cm long; spikelets greenish; tip of lemma entire, with downwardly directed spines just below insertion of awn *S. roylei*

1. ***Stipa basiplumosa*** Munro ex Hook. f., Fl. Brit. Ind. 7, 229 (1896).
Distribution: Southern Russia, Tibet and Ladak in Kashmir, at high altitudes.

Exsicc.—W. Koelz 2386, Ladak, Kashmir; T. Thoms. s.n., Lonak Pass.

The variety, var. *longe-aristata* Munro in Hook. f., Fl. Brit. Ind. 7, 229 (1896) does not belong to this species at all. The awn is 3.5 cm long and is hairy throughout its whole length. It is much closer to *S. purpurea* than to *S. basiplumosa* and may even be a distinct species.

2. ***Stipa breviflora*** Griseb. in Goett. Nachr. 82 (1886).
S. Aliciae Kanitz, Pl. Exped. Szech. As. Centr. Coll. 61 (1891), t. 7, f.4.

Distribution: Tian Shan, Nepal.

A very wiry species on open slopes at 3000 m.

Exsicc.—Stainton, Sykes and Williams 5647, Nepal.

3. ***Stipa bungeana*** Trin. ex Bunge in Mém. Sav. Etr. Pétersb. 2, 144 (1835).

Distribution: Tibet: Vicinity of Lhasa, 13,000 ft.

Exsicc.—H. Richardson s.n., Lhasa.

4. ***Stipa capensis*** Thunb., Prod. Plant. Cap. 19 (1794).
S. tortilis Desf., Fl. Atlant. 1, 99 (1798), t. 31, f.1.

to eat it." This suggests that eating the grass is not always followed by fatal consequences. This is borne out by Dr. Giles when on the Gilgit Expedition in 1887: "This grass acts as a narcotic poison on horses—several of our animals suffered from eating it." Parker says that it is not eaten by stock in the Kulu Valley, which must account for its abundance. Exsicc.—R. R. Stewart 23080, Kashmir; Harsukh 15504, Kurrum Valley. $2n = 24$.

21. ***Stipa splendens* Trin.** in Spreng., Neue Entdeck. 2, 54 (1821).
S. altaica Trin. in Ledeb., Fl. Alt. 1, 80 (1829).
Lasiagrostis splendens (Trin.) Kunth, Rév. Gram. 1, 58 (1829).
Achnatherum splendens (Trin.) Ohwi in J. Jap. Bot. 17, 404 (1941).
 ?*Stipa schlagintweitii* Mez in Fedde, Rep. Sp. Nov. 17, 208 (1921).
 Distribution: Russia, Tibet and Himalaya.
 var. **splendens**.

A fine species common in the Indus Valley.
 Exsicc.—J. F. Duthie 12105, Baltistan; Giles s.n., Gilgit. $2n = 48$.
 var. **gracilis** Bor, var. nov. a typo culmis gracilioribus paniculaque multo minore (10–15 cm longa) satis recedit.
 Distribution: Baltistan, Karakoram.
 Exsicc.—C. B. Clarke 30097, Karakoram.

22. ***Stipa szowitsiana* Trin. ex Hohen.** in Bull. Soc. Nat. Mosc. 243 (1838).

S. barbata var. *szowitsiana* Hack. in Denkschr. Acad. Wien 1, 8 (1889).
 Distribution: South Russia, Pamirs, northwest Himalaya.
 Exsicc.—Lt. Harris 16784, Chitral; G. A. Gammie s.n., Kashmir; J. F. Duthie s.n., Baltistan.

***Trikeriaia* Bor in Kew Bull., 1954, 555 (1955).**

Key to the varieties of *Trikeriaia hookeri*

1. Branches of the panicle up to 15 cm long *T. hookeri* var. *ramosa*
1. Branches of the panicle short, not more than 5 cm long *T. hookeri* var. *hookeri*

1. ***Trikeriaia hookeri* (Stapf) Bor** in Kew Bull. 1954, 555 (1955).
Stipa hookeri Stapf in J. Linn. Soc. (Bot.) 30, 120 (1894).
Timouria aurita Hitchc. in J. Wash. Acad. Sci. 23, 134 (1933).
Achnatherum hookeri (Stapf) Keng, Clav. Gram. Prim. Sin. 213 (1957).
 var. **hookeri**.

Distribution: India and Tibet at an altitude of about 4400 m.
 Exsicc.—Koelz 2328, Kashmir; Thorold 124, Tibet.

- var. **ramosa** Bor in Kew Bull. 1954, 557 (1955).

A variety with long branches so far only found in the Tsangpo Valley, Tibet, at about the same altitude.
 Exsicc.—F. Kingdon-Ward 12295, Tibet (type in B.M.).

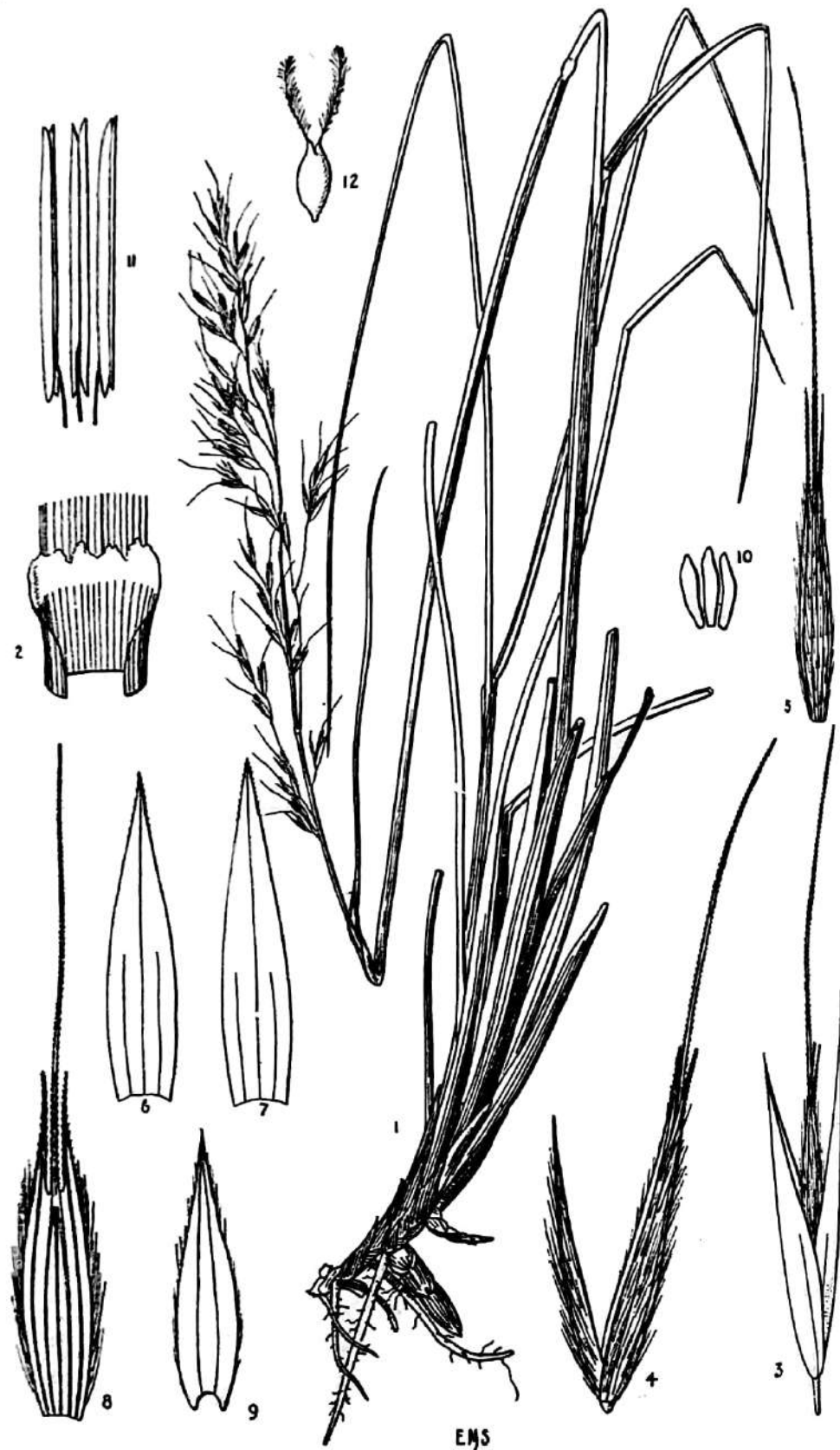


Fig. 78 *Trikeria hookeri* (Stapf) Bor
 1, plant $\times \frac{1}{4}$; 2, ligule $\times 6$; 3, spikelet from side $\times 5$; 4, floret $\times 5$; 5, floret from back $\times 5$; 6, lower glume $\times 5$; 7, upper glume $\times 5$; 8, lemma from inside $\times 5$; 9, palea from inside $\times 5$; 10, lodicules $\times 6$; 11, stamens $\times 8$; 12, gynaecium $\times 8$.

POOIDEAE—STREPTOGYNEAE

STREPTOGYNEAE *C. E. Hubbard* in Hook., Ic. Pl. tab. 3572 (1956)

Spikelets all alike, 4–7-flowered, the lower 2–4 hermaphrodite, the others reduced, terete or slightly laterally compressed, 2-seriate; rhachilla disarticulating above the glumes and between the florets. Glumes persistent, unequal, herbaceous to coriaceous, the lower half the length of the upper, 1–4-nerved, the upper embracing the base of the spikelet, 6–17-nerved; lemma coriaceous, round on the dorsal surface, entire or provided with a short awn at the tip, 7–13-nerved, with anastomosing strands at the top; palea narrowly linear, 2-nerved with the nerves close together. Lodicules 3, glabrous. Stamens 2. Ovary glabrous or pilose at the tip; styles long; stigmata very long, retrorsely hispid or scabrid; hilum linear, the length of the grain; starch-grains simple, very small.

Erect perennial grasses. Leaves shortly petioled, linear-lanceolate to narrowly elliptic, with tessellate nervation and mesophyll of arm-cells; silica-cells saddle-shaped; 2-celled micro-hairs absent; sheaths auricled at the mouth and with a thickened dorsal apical rim; ligules short, truncate, membranous. Inflorescence of terminal spiciform racemes of alternate biseriate secund spikelets seated on short pedicels attached to the continuous rhachis.

Chromosomes small; basic number 12.

Genus: Streptogyna.

Streptogyna *P. Beauv.*, Ess. Agrost. 80 (1812), t. 16, f.8.

1. **Streptogyna crinita** *P. Beauv.*, Ess. Agrost. 80 (1812), t. 16, f.8.

S. gerontogaea Hook. f. in Trimen, Handb. Fl. Ceylon 5, 301 (1900).

Distribution: South India (Travancore, Cochin), Ceylon and Tropical Africa.

This is a true forest grass and is often found in deep shade. The leaves are petioled, and the widely spreading rhizomes are covered with overlapping coriaceous scales. At anthesis the long styles and retrorsely barbed stigmas are thrust out of the florets and instead of withering at maturity and falling, they and the awns of the lemmas become twisted and bound together in an inextricable mass. The seeds are held firmly within the lemma and palea and the whole mass is capable of being carried by the fur of animals in a peculiar way. The joint of the rhachilla at the base of each floret acts as a hook and an animal brushing against a mature inflorescence of *Streptogyna* is bound to carry the whole mass of mature caryopses away with it. These are then scattered over a wide area as the inflorescence breaks up.

Exsicc.—*J. Fernandez* 12, Cochin; *Narayanaswami*, Travancore; *Thwaites* C.P. 922, Ceylon.

POOIDEAE—THYSANOLAENEAE

THYSANOLAENEAE C. E. Hubbard in Hutch., Fam. Flow. Pl. 2, 222 (1934)

Spikelets all similar, minute, 2- rarely 3-flowered, with the lower floret barren and reduced to the lemma and the upper hermaphrodite and the third, if present male, or much reduced; rhachilla tough, tardily disarticulating above the glumes and between the florets, produced beyond the upper floret and sometimes carrying a rudimentary floret; pedicel fragile, breaking up and allowing the spikelet to fall. Glumes about half as long as the lemmas, obtuse, nerveless, or obscurely 1-nerved, delicate; lower lemma the length of the spikelet, thinly membranous, acuminate, 1-3-nerved; palea absent; upper lemma ovate, acute or mucronate, becoming slightly indurated, 3-nerved, ciliate on the margins with long erect hairs; palea short; hyaline, truncate. Lodicules 2, cuneate. Stamens 2. Grain free between the lemma and palea; hilum basal; embryo about one-third as long as the grain.

Perennial shrubs with solid reed-like culms. Leaf-blades very broad, firm, long, with festucoid anatomy; silica-cells intermediate between cross- and dumb-bell-shaped; micro-hairs 2-celled, narrow; ligules cartilaginous, short, truncate. Spikelets pedicelled on the branches of very large, much divided panicles.

Chromosomes small; basic number 11.

Genus: *Thysanolaena*.

Thysanolaena Nees in Edinb. New Phil. J. 18, 180 (1835).

- ✓ 1. *Thysanolaena maxima* (Roxb.) O. Ktze., Rev. Gen. Pl. 2, 794 (1891).

Agrostis maxima Roxb., Fl. Ind. 1, 319 (1820).

Melica latifolia Roxb., loc. cit. 330.

Panicum acariferum Trin., Sp. Gram. 1 (1828), t. 87.

Myriachaeta arundinacea Zoll. et Moritzi, Syst. Verz. Zoll. 101 (1846).

M. glauca Moritzi ex Steud., Syn. Pl. Glum. 1, 404 (1855).

Thysanolaena agrostis Nees in Edinb. New Phil. J. 18, 180 (1835).

**T. birmanica* Gdger. in Bull. Soc. Bot. Fr. 66, 303 (1919).

**T. assamensis* Gdger., loc. cit. 303.

**T. sikkimensis* Gdger., loc. cit. 303.

Also several nomina nuda such as *Agrostis latifolia* Heyne in Herb. Rottl.; *A. scoparia* Koenig ex Herb. Rottl. non Steud. (1854).

* Per errorem *Thysanochlaena*

POOIDEAE—TRITICEAE

TRITICEAE Dumort., Obs. Gram. Belg. 82 (1823)

Hordeae Spenner, Fl. Friburg. 1, 155 (1825) as *Hordeaceae*

Spikelets 1- to many-flowered, solitary or in groups of 2-6 (usually 3), mostly hermaphrodite and sessile and alike, or the lateral spikelets of a cluster sometimes shortly pedicelled and male or barren and much reduced, alternating on the opposite sides of a continuous or jointed rhachis; rhachilla disarticulating above the glumes and between the florets or tough in cultivated cereals. Glumes coriaceous, strongly nerved, often reduced to awl-shaped empty structures, those of fertile spikelets awnless or awned; lemmas 5- to many-nerved, awnless or awned; awn short or long, straight or recurved, not twisted or kneed. Lodicules 2. Stamens 3. Ovary obovate with a hairy appendage; styles 2, distinct, often very short; grain free or adhering to the lemma and/or palea; hilum long, linear; embryo small; starch-grains simple.

Annual or perennial herbs. Leaf-sheaths usually with small auricles at the mouth; blades narrow with festucoid anatomy; silica-cells oblong, rounded or elliptic; 2-celled micro-hairs absent. Inflorescence spike-like with a continuous or disarticulating rhachis (spike-axis).

Chromosomes large; basic number 7.

<i>Genera:</i> <i>Aegilops</i>	<i>Heteranthelium</i>
<i>Agropyron</i>	<i>Hordeum</i>
x <i>Elymordeum</i>	<i>Hystrix</i>
<i>Elymus</i>	<i>Secale</i>
<i>Eremopyrum</i>	<i>Taeniatherum</i>
<i>Henrardia</i>	<i>Triticum</i>

Key to the genera of **Triticeae**

1. Spikelets normally solitary at each node of the spike-axis:—
2. Spikelets 1-2-flowered, awnless, sunken in the jointed fragile spike-axis and closely appressed to it; florets enclosed by the glumes; lemmas thin, membranous, 5-3-nerved **Henrardia**
2. Spikelets 2-12-flowered, awned or awnless, slightly appressed to the spike-axis or spreading from it, not sunken; florets at least the upper ones exceeding the glumes; lemmas thicker, herbaceous or coriaceous, 5-nerved:—
3. Spikelets of two kinds, fertile and sterile, both different in appearance. In the fertile spikelets the lower two florets perfect, bisexual, warty, long-hairy; the others barren, scale-like, in a pedicelled cluster; sterile spikelets composed of barren scale-like florets only **Heteranthelium**

3. Spikelets all alike in the same spike or the upper ones sterile (aborted); lemma glabrous, scabrous or hairy, but never warty:—
4. Spikelets 2-flowered; glumes very narrow, subulate, 1-nerved; lemmas stiffly hairy on the keels **Secale**
4. Spikelets usually more than 2-flowered; glumes broader, usually more than 1-nerved; lemmas not stiffly hairy on the keels or mid-rib:—
5. Nerves of the lemmas not confluent at the tip; annuals:—
 6. Glumes and lemmas keeled on the back; grain free between lemma and palea **Triticum**
 6. Glumes and lemmas rounded on the back; grain tightly enclosed between the lemma and palea and adhering to the latter or free **Aegilops**
5. Nerves of the lemma confluent at the tip; perennials and annuals:—
 7. Spike-axis fragile, readily disarticulating at maturity beneath each spikelet; glumes keeled, slightly connate at the base, becoming thickened at the margin; annuals **Eremopyrum**
 7. Spike-axis tough, continuous; spikelets breaking up or falling entire at maturity; glumes not keeled (except *A. pectiniforme*) nor connate at the base; margin of the glumes scarious or herbaceous, not thickened; perennials **Agropyron**
1. Spikelets more than one at each node of the spike-axis (solitary in part of the spike in some species of *Elymus* and in hybrids between *Agropyron* and *Elymus*):—
 8. Spikelets 1-flowered, usually with a rudiment of the second floret:—
 9. Spikelets 3 at each node of the spike-axis: central spikelet sessile, fertile, the lateral pair pedicelled, barren (in wild species) or sessile, fertile or barren (in cultivated species); glumes standing in front of the spikelets **Hordeum**
 9. Spikelets 2 at each node of the spike-axis, sessile; glumes standing more or less laterally:—
 10. Spike short, dense; glumes long (2–2.7 cm), bristle-like, connate at the base; lemma tapering into a very long awn (6–10 cm), which is dilated toward the base; annuals **Taeniatherum**
 10. Spike slender, loose; glumes absent or very short, subulate, not connate at the base; lemma tapering into a long awn (2–2.5 cm), which is not conspicuously dilated toward the base; perennials **Hystrix**
 8. Spikelets 2–7-flowered:—
 11. Rhachis fragile
 11. Rhachis tough

h
 × **Elym^hordeum**
Elymus

addenda

Aegilops Linn., Gen. Pl. ed. 5, 470 (1754), et Sp. Pl. ed. 1, 1050 (1753).
Key to the species of *Aegilops*

1. Lower glumes mostly truncate, sometimes with teeth or the latter produced into awns, but then only a few of the spikelets at the top so awned:—
 2. Spike hairy, usually thick, spikelets inflated *A. crassa*
 2. Spike \pm scabrid, cylindrical; spikelets not inflated *A. tauschii*
1. All spikelets awned; lower glumes 2–3 awned; awns on the lemmas always stronger than those on the glumes if the latter are awned:—
 3. Glumes 5–6 mm long, 3–4 mm wide; caryopsis at maturity adherent to the lemma and palea; nerves of the glumes narrow, \pm equal in breadth, parallel *A. kotschyi*
 3. Glumes 8–9 mm long, 4–5 mm wide; caryopsis always free; nerves of the glumes broad, not always distinct, unequally broad and long *A. triuncialis*

1. ***Aegilops crassa* Boiss.**, Diagn. sér. 1, 7, 129 (1846).

Triticum crassum (Boiss.) Aitch. et Hemsl. in Trans. Linn. Soc., sér. 2, 3, 127 (1886).

Distribution: Afghanistan, Central Asia, Persia, Mesopotamia to Palestine.
 $2n = 28, 42$.

Exsicc.—Aitchison 461, Afghanistan.

2. ***Aegilops kotschyi* Boiss.**, Diagn. sér. 1, 7, 129 (1846).

Ae. geniculata Fig. et de Not., Agrost. Aegypt. Frag. pars 1, 18 (1851).

Ae. triuncialis Boiss. var. *kotschyi* Boiss., Fl. Or. 5, 674 (1884).

Triticum triunciale Godr. et Gren. var. *kotschyi* Aschers. et Graebn., Syn. Mitteleur. Flor. 2, 707 (1901).

Ae. triuncialis L. var. *leptostachya* Bornm. in Verh. k.k. Zoo.-Bot. Ges., Wien, 109 (1898).

Distribution: Afghanistan, Central Asia. $2n = 28$.

Exsicc.—Griffith 549, Afghanistan; a solitary specimen collected with *Ae. triuncialis* Linn.

3. ***Aegilops tauschii* Cosson**, Not. Pl. Rar. Nouv. 2, 69 (1849).

Triticum tauschii (Cosson) Schmal., Fl. Mittl. Süd. Russl. 2, 662 (1897).

Distribution: Kashmir, Afghanistan, Central Asia, Persia.
Very common in stony places. $2n = 14$.

Exsicc.—J. H. Lace 3779, Baluchistan.

A recent examination of the type of *Ae. squarrosa* in the Linnean Herbarium shows that it is a form of *Ae. triuncialis* Linn., hence the species called *Triticum Aegilops* P. Beauv. in the *Flora of British India*, based on *Ae. squarrosa* Linn., must be known by the next available name—*Aegilops tauschii* Cosson.

4. ***Aegilops triuncialis*** Linn., Sp. Pl. ed. 1, 1051 (1753).
Ae. elongata Lamk., Fl. Franç, 3, 632 (1778).
Triticum triunciale Rasp. in Ann. Sci. Nat. sér. 1, 5, 435 (1825).
Aegilops triaristata Requ. ex Bert., Fl. Ital. 1, 789 (1833).
Ae. persica Boiss., Diag. sér. 1, 7, 129 (1846).
Ae. croatica Gandg. in Schedae Florae Croaticae, 6046 (1889).
 Distribution: Afghanistan, Central Asia, Persia, Balkans, Krim.
 Common in shady places or gravelly soil. $2n = 28$.
 Exsicc.—*Aitchison* 495, Afghanistan.

Agropyron Gaertn. in Nov. Comm. Acad. Petrop. 14, 539 (1770).

Key to the species of *Agropyron*

1. Glumes and lemmas conspicuously keeled, short-awned; spike dense (joints of the axis very short); spikelets crowded, somewhat spreading, pectinate *A. pectiniforme*
1. Glumes and lemmas not keeled or slightly keeled; spikelets not pectinate:—
 2. Lemma awnless or short-awned (awns shorter or as long as the lemma):—
 3. Glumes large (the lower three-quarters to four-fifths the length of lower floret), with a broad scarious margin (0.3–0.7 mm), usually broadly lanceolate, blunt, obliquely truncate, 1- or 2-toothed or mucronate, rarely short-awned, usually 5–7-nerved, nearly glabrous or minutely hairy *A. dentatum*
 3. Glumes not as above:—
 4. Lemma completely glabrous:—
 5. Plants with long creeping rhizomes; spikelets falling entire at maturity:—
 6. Leaf-sheaths not ciliate at the margins; glumes lanceolate, tapering into a short mucro or awn, slightly scabrous on the mid-rib toward the tip *A. repens*
 6. Leaf-sheaths ciliate at the margins; glumes broad, oblong-lanceolate or oblong, more or less obliquely truncate at the tip, smooth *A. intermedium*
 5. Tufted plants; spikelets breaking up at maturity, the glumes persisting on the spike-axis; leaves densely minutely hairy on the ribs of the upper surface or scabrous:—
 7. Spikelets often slightly bent from the spike-axis; glumes subacute to more or less rounded at the tip; lemma usually truncate or slightly notched at the tip, usually awnless; anthers 3.5–4.5 mm long; leaves densely minutely hairy on the ribs of the upper surface, sometimes also beneath *A. cognatum*

- tipped with a short awn, 0.5–2 mm long; anthers 2–2.5 mm long; leaves scabrous on the upper surface, glabrous, smooth beneath
4. Lemma more or less hairy:—
A. stewartii
8. Lemma and glumes minutely hairy along the margins, glabrous on the back:—
9. Leaves narrow, 2–2.5 mm wide, densely and minutely hairy on the ribs above; spikelets 2 cm long; glumes lanceolate, coriaceous, with scarious margins, 3–5-nerved, gradually tapering into a short awn; lemma blunt or notched at the tip, awnless
A. pamiricum
9. Leaves broader, with scattered fairly long hairs on the ribs of the upper surface; spikelets 1–1.3 cm long; glumes broadly oblong-lanceolate, very tough and rigid, 5–7-nerved, broadly triangular and blunt or obliquely truncate and mucronate at the tip; lemma blunt and mucronate at the tip
A. afghanicum
8. Lemma hairy all over:—
10. Plant with long-creeping rhizomes; leaf-sheaths ciliate at the margins; leaf-blades rigid, prominently and closely ribbed on the upper surface, with scattered long hairs on both sides; spikes loose; spikelets falling entire at maturity; glumes very tough and rigid, oblong-lanceolate, very obtuse or more or less truncate at the tip
A. trichophorum
10. Tufted plants; leaf-sheaths not ciliate on the margins; leaf-blades herbaceous, not prominently ribbed; spikes usually dense; spikelets breaking up at maturity, the glumes persisting on the spike-axis; glumes coriaceous, gradually tapering into a short awn at the tip:—
11. Culm glabrous; spike 1–1.5 cm broad; lemma silky villous; glumes 1–3-nerved, usually with scattered long hairs on the mid-rib, sometimes also on the surface; palea long-ciliate on the keels
A. thoroldianum
11. Culm minutely hairy on nodes and below; spike narrower; lemma minutely hairy; glumes 5–7-nerved, scabrous on the nerves and often minutely hairy between them
A. mutabile
2. Awn of the lemma longer than the lemma:—
12. Awn of the lemma erect or slightly flexuous:—
13. Palea considerably shorter than the lemma (three-quarters the length of the latter or less); glumes closely and prominently 5–7-ribbed, with a very narrow scarious margin (about 0.1 mm wide); spike-axis usually minutely hairy:—
14. Spikelets distant on the spike-axis; glumes linear-lanceolate (the lower half to two-thirds the length of the lower floret), more or less blunt or acute; plant slender
A. semicostatum

14. Spikelets more approximate or contracted; glumes linear-oblong or oblong-lanceolate (the lower nearly as long as the lower floret), acuminate; plant usually robust and tall
A. striatum
13. Palea nearly as long as the lemma or slightly longer:—
15. Lower glume exceeding or nearly as long as the lower floret; glumes 5-7-nerved:—
16. Glumes oblong-elliptic, very tough and rigid, prominently ribbed, very scabrous on the ribs, abruptly tapering into a short rigid awn; lemma long-hairy along the margins, glabrous on the back; anthers 4-5.5 mm long
A. borianum
16. Glumes oblong-lanceolate, coriaceous, distinctly ribbed, scabrous on the ribs, gradually tapering into a short awn or acute; lemma slightly minutely hairy toward the tip, glabrous on the back; anthers about 2.5 mm long
A. tibeticum
15. Lower glume (excluding awn) distinctly shorter than the lower floret; glumes usually 1-5-nerved:—
17. Spike more or less nodding; lemma glabrous or minutely hairy; glumes with a narrow scarious margin, up to 0.3 mm wide:—
18. Lemma glabrous on the back, slightly scabrous toward the tip:—
19. Culm minutely hairy on and below the nodes, smooth below the spike; keels of the palea not prolonged in awn-like appendages:—
20. Slender plant; leaf-sheaths ciliate at the margins; spikes nearly erect; glumes acute or mucronate; rhachilla minutely scabrous; palea rounded at the tip
A. kuramense
20. Stout plant; leaf-sheaths not ciliate on the margins; spikes nodding; rhachilla hairy; palea truncate or notched at the tip
A. caninum
19. Culm glabrous on and below nodes, scabrous below the spike; keels of the palea often prolonged into very short awn-like appendages
A. sikkimense
18. Lemma minutely hairy:—
21. Spike-axis, glumes, rhachilla and palea between keels minutely hairy; glumes lanceolate, 5-7 mm long, acute or mucronate; culm slightly short-hairy below the nodes
A. nepalense
21. Spike-axis scabrous on the margins; glumes oblong-lanceolate, 8-10 mm long, short-awned; glumes scabrous on the nerves; lemma scabrous on the back, becoming

- glabrous toward the tip; culm glabrous below the nodes
17. Spike erect; lemma long-hairy (silky villous); glumes with a broad scarious margin, 0.4 mm and more wide *A. russellii*
12. Awn of the lemma curved at maturity:— *A. thomsonii*
22. Glumes large, the lower as long as or somewhat shorter than the lower floret, broadly lanceolate, 5-7-nerved, with broad scarious margins:—
23. Spike with many spikelets, dense; glumes 1.1-1.8 cm long, prominently nerved, scabrous on the nerves; lemma 1-1.4 cm long, with minute appressed hairs; leaves flat, usually 5-6 mm wide *A. macrolepis*
23. Spike with a few spikelets; glumes 0.8-1.1 cm long, not prominently nerved, glabrous; lemma 0.8-1 cm long, minutely hairy; leaves narrow, convolute *A. curvatiforme*
22. Glumes considerably shorter than the lower floret:—
24. Glumes elliptic, 5-7-nerved, abruptly tapering into a short mucro, short-hairy along the margins; lemma long-hairy along the margins, glabrous on the back; palea considerably shorter than the lemma, rounded at the tip *A. ciliare*
24. Glumes lanceolate or oblong-lanceolate, 1-5-nerved, acute, acuminate or awned, scabrous on the nerves; lemmas not hairy as above; palea nearly as long as the lemma, usually truncate or notched at the tip:—
25. Rhachilla twisted at base, bringing the florets more or less dorsiventral to the spike-axis (the mid-rib of the lower glume is not in the same line with that of the lower floret); spike often dense, one-sided (the plant resembles *Elymus nutans*, but its glumes are broader and the spikelets solitary at each node of the spike-axis) *A. schrenkianum*
25. Rhachilla not twisted at base; florets are not placed dorsiventral to the spike-axis (the mid-rib of the lower glume is in the same line with that of the lower floret):—
26. Spike very slender; spikelets linear-lanceolate; glumes 2.5-4.5 mm long, acute; rhachilla about 3 mm long *A. microlepis*
26. Not as above:—
27. Glumes linear-lanceolate, narrow, usually 6-10 mm long, gradually tapering into an awn 4-10 mm long, somewhat spreading at maturity *A. himalayanum*
27. Glumes lanceolate, acute, acuminate or with a short awn usually less than 4 mm long, not spreading at maturity:—
28. Spikelets slightly compressed laterally, not readily disarticulating when dried immature; awn of the

lemma not conspicuously dilated at the base nor furrowed; glumes usually not irregularly toothed; spike with a flexuous spike-axis, 5–10 cm long; spikelets purplish or purplish-green; leaves densely short-hairy on both surfaces *A. schugnanicum*

28. Spikelets compressed laterally, readily disarticulating when dried immature; awn of the lemma conspicuously dilated at the base and furrowed; glumes often irregularly toothed; spike erect, somewhat flexuous or nodding, short or long; leaves not as above:—

29. Culm 10–30 cm high; lower leaf-sheaths hyaline-silvery, shining; leaves narrow, convolute; lemma 7–8 mm long, glabrous; anthers 1.5–2 mm long

A. jacquemontii

29. Culm usually 30–70 cm high; lower leaf-sheaths not hyaline; culm-leaves often flat, up to 4.5 mm wide; lemma usually 9–12 mm long, minutely scabrous at least in the basal part, sometimes hairy; anthers longer:—

30. Leaf-sheaths long-ciliate at the margins; leaf-blades flat, with scattered long hairs on the upper surface and at the margins, especially toward the base; awn of the lemma usually 2.5–3.5 cm long, fairly slender *A. duthiei*

30. Leaf-sheaths not ciliate at the margins; leaf-blades, usually convolute, densely minutely hairy on the upper surface, not long-hairy at the margins; awns longer, more robust

A. canaliculatum

1. ***Agropyron afghanicum*** Melderis in Appendix, p. 689

Distribution: Afghanistan.

Exsicc.—J. E. T. Aitchison 1145, Afghanistan, Khorasan (with *A. repens*).

2. ***Agropyron borianum*** Melderis in Appendix, p. 690

Distribution: Chitral, Swat.

Exsicc.—S. M. Toppin 584, Chitral; A. Rahman, Swat: Kalam (229), Sho Nala (239).

3. ***Agropyron canaliculatum*** Nevski in Bull. Jard. Bot. Acad. Sc. U.R.S.S. 30, 509 (1932).

Brachypodium tataricum Munro ex Aitchison in J. Linn. Soc. (Bot.) 18, 109 (1881), nomen nudum.

Agropyron longe-aristatum var. *Aitchisoni* Boiss., Fl. Or. 5, 660 (1884).

A. longe-aristatum auct. fl. ind.

A. flexuosissimum Nevski in Bull. Jard. Bot. Acad. Sc. U.R.S.S. 30, 510 (1932).

Distribution: Afghanistan, Central Asia, Himalayas, Tibet.
 Exsicc.—*J. E. T. Aitchison* 962, Afghanistan: Kurrum Valley, Sergal and
 Sikarām, amongst rocks and large stones; *G. Wingate*, N.W. India; *Hassan*
ud Din 16, Pakistan: N.W. Frontier Province; *Siddiqui and Rahman* 26748,
 Chitral: Urghosh Dhok; *P. Wendelbo*, Chitral: Barum Gol, Zapotili;
R. R. Stewart 22318, Kashmir: Descent Marpo La to Drás; *F. Schmid*,
 Kashmir: Mahthantir Gah (2215), Anesarbar (2242); *J. F. Duthie*, Kashmir
 (Baltistan): Drás Valley (11744), Marpu nullah (11825); *C. B. Clarke*,
 Kashmir: Deosai (29827 A); *N. L. Bor*, Lahul: Khoksar-Sissu (14573),
 Kylang (14913), Darcha (15251); *T. Thomson*: Piti, Valley below Hongo;
 W. Tibet; *Strachey and Winterbottom*, Plain of Tibet (3); Tibet: Karnali
 river (5); *S. R. Kashyap*, Chandradal. Forms with hairy spikelets: *R. R.*
and I. D. Stewart 22730, 22732 B, Kashmir: Kamri Pass; *J. F. Duthie*,
 Chamba State: Pangri, Luj Forest; *J. R. Drummond* 21129, Kunawur.

4. ***Agropyron caninum* (Linn.) P. Beauv.**, Ess. Agrost. 102, 146 (1812).
Triticum caninum Linn., Sp. Pl. 86 (1753).
Elymus caninus Linn., Fl. Suec. ed. 2, 39 (1755).
Goulardia canina (Linn.) Husnot, Gram. Fran. 83 (1899).
Agropyron abchazicum Woron. in Monit. Jard. Bot. Tiflis. 22, 2 (1912).
Zeia canina (Linn.) Lunell, Amer. Midl. Nat. 4, 226 (1915).
Roegneria canina Nevski in Komarov, Fl. U.R.S.S. 2, 617 (1934).
 Distribution: Europe, Asia Minor, Iran, Central Asia, northwestern
 India, Siberia. $2n=28$.
 Exsicc.—*C. B. Clarke* 30679, Kashmir: Tilail; *R. R. Stewart*, Kashmir:
 Sonamarg, by stream (22409), Khillanmarg above Gulmarg (10403),
 Pahlgam, snow nullah (21514).

5. ***Agropyron ciliare* (Trin.) Franchet**, Pl. David. 341 (1884).
Triticum ciliare Trin. in Bunge, Enum. Plant. in China coll. 72 (1836).
Roegneria ciliaris (Trin.) Nevski in Komarov, Fl. U.R.S.S. 2, 607
 (1934).
 Distribution: Assam, Far East, China, Japan. $2n=28$.
 Exsicc.—*F. Kingdon-Ward* (19479, 20080), Assam: Lohit Valley, Di Chu.
6. ***Agropyron cognatum* Hackel** in Allg. Bot. Z. Jahrg. 1904, 22 (1905).

Key to the varieties of *A. cognatum*

- | | |
|---|------------------------|
| 1. Lemma truncate or slightly notched at the tip | var. <i>cognatum</i> |
| 1. Lemma tipped with a short awn, up to 7 mm long | var. <i>shingoense</i> |
- var. ***cognatum***.
Agropyron ferganense Drob. in Trav. Mus. Bot. Acad. Sc. Petrogr. 16,
 138 (1916).
A. dshungaricum Nevski in Komarov, Fl. U.R.S.S. 2, 641 (1934).
Elytrigia ferganensis (Drob.) Nevski in Act. Univ. As. Med. sér. 8b,
 fasc. 17, 61 (1934).

E. dshungarica (Nevski) Nevski in Act. Univ. As. Med. sér. 8b, fasc. 17, 61 (1934) et in Act. Inst. Bot. Acad. Sc. U.R.S.S., sér. 1, 2, 81 (1936).

Distribution: Central Asia, northwestern India.

Exsicc.—*T. Thomson*, W. Tibet: Drás, Zanskar; *J. F. Duthie*, Kashmir (Astor): Mushkin Forest, Astor Valley (12276), Gudhai Valley (12188); *R. R. Stewart*, Kashmir (Astor): above Rattu (21791a), above Shankargarh, Upper Astor Valley (22751); *F. Schmid*, Kashmir: Holshal near Nagar (1961), Talas (2227); *R. R. Stewart*, Kashmir (Gilgit): Nagar to Hopar Glacier (26606), Naltar Lakes (26608), Nomal-Naltar (26611); *Giles*, Gilgit: Chugaum; *C. B. Clarke* 30113, 30513, Karakoram; *R. Scott Russell* 1328, 1339, Karakoram, Kero Lugma Glacier, left bank.

var. *shingoense* Melderis in Appendix, p. 690

Distribution: Northwestern India.

Exsicc.—*J. F. Duthie* 11895, Kashmir (Baltistan): Shingo Valley; *T. Thomson*, W. Tibet: Ladak; *R. R. Stewart* 21791a, Kashmir (Astor): above Rattu.

7. ***Agropyron curvatiforme*** Nevski in Bull. Jard. Bot. Acad. Sc. U.R.S.S. 30, 633 (1932).

Distribution: Afghanistan.

Exsicc.—*J. E. T. Aitchison* 903, Afghanistan: Kurrum Valley.

8. ***Agropyron dentatum*** Hook. f., Fl. Brit. Ind. 7, 370 (1896).

Key to the varieties of *A. dentatum*

1. Lemma awnless, toothed at the tip or with a short mucro:—
 2. Glumes 5–7-nerved; leaf-blades and sheaths glabrous
var. *dentatum*
 2. Glumes 3-nerved; leaf-blades and sheaths densely short-hairy
var. *kashmiricum*
1. Lemma with a short awn up to 4 mm long:—
 2. Spike 12–15 cm long, about 6 mm wide; glumes 5–7-nerved, gradually tapering into up to 2 mm long awn, scabrous on the nerves; lemma 10–11 mm. long; leaves glabrous, almost smooth
var. *elatum*
 2. Spike 6–7 cm long, about 4 mm wide; glumes 3–5-nerved, more or less abruptly tapering into a short awn up to 2 mm long, scabrous on the nerves and internerves; lemma 8–9 mm long; leaves scabrous
var. *scabrum*

var. ***dentatum***.

Distribution: Himalayas, Tibet.

Exsicc.—*C. B. Clarke*, 30186 A, Karakoram; *R. Scott Russell*, Karakoram: Hispar Glacier, left bank (1869), Sokha Glacier, right bank (1629); *C. B. Clarke*, 30682, Kashmir: Tilail; *T. Thomson*, W. Himalaya: Báltal; *F. Schmid* 2213, Kashmir: Mahthantir Gah; *J. F. Duthie* 11601, Kashmir: near Báltal in Sind Valley; *V. Jacquemont* 1020, Kashmir: Sind; *J. F. Duthie* 13757, Baltistan: above Drás, on loose debris; *T. Thomson*, W.

33. *Agropyron trichophorum* (Link) Richt., Pl. Eur. 1, 124 (1890).
Triticum trichophorum Link in Linnaea 17, 395 (1843).
T. hirsutum Stev. ex Schrad. in Linnaea 12, 466 (1838) non Hornem.
 (1838).
Agropyrum Aucheri Boiss., Diagn., sér. 1, 5, 75 (1844).
Elytrigia trichophora (Link) Nevski in Act. Univ. As. Med., ser. 8b,
 fasc. 17, 62 (1934).

Distribution: S. Europe, Caucasus, Asia Minor, Iran, Central Asia,
 Afghanistan. $2n = 42$.

It might be expected to occur in Western India.

Exsicc.—J. E. T. Aitchison, Afghanistan, Badghis.

× *Elyhordeum* Mansfeld

× *Elymordeum* Lepage in Natural. Canad. 84, 97 (1957).
 (*Elymus* × *Hordeum*)

Elymordeum × *schmidii* Melderis in Appendix, p. 696.
 (*Elymus nutans* × *Hordeum turkestanicum*)

Distribution: Chitral.

Exsicc.—F. Schmid 2334, Pakistan: Chitral, Upper Yarkhun Valley.

A sterile intergeneric hybrid, the product of the crossing of *Elymus nutans* × *Hordeum turkestanicum* as putative parental species. In habit this hybrid resembles a species of *Hordeum* with a thick, purplish, conspicuously awned spike. The leaves are densely minutely hairy as in *H. turkestanicum*. The spike is 4–6.5 cm long and 7–8 mm wide. The spikelets are sometimes in threes, usually in twos (in the lower part of the spike) or solitary (in the upper part) at each node of the spike-axis (this character indicates that *E. nutans* might be the second parent). The spike-axis is fragile, fracturing at maturity beneath each cluster of spikelets, but is less fragile than in *H. turkestanicum*. The spikelets are 2-flowered, with a rudiment of the third floret. The glumes (including awns) are 6–7 mm long, 1-nerved, dilated toward the base. The lemma is 7–9 mm long, densely short-hairy as in *H. turkestanicum*.

Elymus Linn., Pl. ed. 5, 36 (1754) et Sp. Pl. ed. 1, 83 (1753).

Key to the species of *Elymus*

1. Tufted plants; spikes nodding, flexuous, one-sided or erect, usually loose; spikelets usually in twos; lemmas usually scabrous, tapering into a more or less bent awn, usually 1.3–2.3 cm long; anthers short, 1.5–2.5 mm long:—
2. Glumes usually 3–5-nerved, nearly as long as the lower floret; spike erect, dense
E. dahuricus

2. Glumes 1-3-nerved, much shorter than the lower floret (excluding awns):—
 3. Spike more or less dense, flexuous or one-sided, 5.5-13 cm long; glumes tipped with an awn which is usually shorter than the glume; spikelets distinctly pedicelled *E. nutans*
 3. Spike loose, nodding, drooping or flexuous, 10-24 cm long; glumes tipped with an awn which is usually as long as or longer than the glume; spikelets sessile *E. sibiricus*
1. Plant with long-creeping rhizomes; spike erect, dense; spikelets in twos to fours at each node of the spike-axis; lemma more or less silky villous, rarely almost glabrous, tapering into a short awn, 1-3 mm long; anthers about 4 mm long *E. dasystachys*
1. ***Elymus dahuricus* Turcz.** in Bull. Soc. Nat. Mosc. 29, 1: 61 (1856).

Key to the varieties of *E. dahuricus*

1. Spikelets 3-4-flowered; glumes 7-10 mm long, 3-5-nerved; lemma 7-9 mm long, with an awn about 1.3 cm long var. *dahuricus*
 1. Spikelets 2-3-flowered; glumes 5-6 mm long, 1-3-nerved; lemma 5-7 mm long, with an awn 3-6 mm long var. *micranthus*
- var. ***dahuricus***

Clinelymus dahuricus Nevski in Bull. Jard. Bot. Acad. Sc. U.R.S.S. 30, 645 (1932).

Distribution: Iran, Central Asia, northwestern India, Eastern Turkestan, Siberia, Mongolia, China. 2n = 28, 42.

Exsicc.—*Falconer* s.n.; *Norris* 25181, Pakistan: Bumbrat; *G. A. Gammie*, Kashmir: Kangan, Sind Valley; *C. B. Clarke*, Kashmir: Skardu (29939 B), Kunzlwang (29389); *F. Schmid*, Kashmir: Baltit (1916, 1920), between Gilgit and Imrit (2047); *Stainton, Sykes and Williams*, Nepal: Tukucha, Kali Gandaki, edge of field (933), Marpha, Kali Gandaki Valley, on edge of barley field (5632); *Stoliczka*, Lahul; *C. B. Clarke* 30144 A, Karakoram; *T. Thomson*, W. Tibet: Ladak, Nubra; *H. E. Richardson*, Tibet: Lhasa.

var. ***micranthus* Melderis** in Appendix, p. 697.

Distribution: Northwestern India.

Exsicc.—*J. J. Norris* 25184, Pakistan: Bumbrat; *T. Thomson*, W. Tibet: Shyok Valley.

2. ***Elymus dasystachys* Trin. in Ledeb., Fl. Alt. 1, 120 (1829).**

E. Thomsoni Hook. f., Fl. Brit. Ind. 7, 374 (1896).

Aneurolepidium dasystachys (Trin.) Nevski in Komarov, Fl. U.R.S.S. 2, 706 (1934).

Distribution: Central Asia, northwestern India, Eastern Turkestan, Siberia, Mongolia, China.

Exsicc.—*J. F. Duthie*, Kashmir (Astor): Gudhai Valley (12185); Kashmir (Baltistan): Satpur above Skardu (12033), Shingo Valley (11891); Kashmir (Gilgit): Naltar Valley (12358); *Giles*, Gilgit: Chugaum; *C. B. Clarke* 30063, 30087 A, Kashmir: Shigar; *W. Koelz* 5471, Kashmir: Zaskar,

Khola, by grassy track (3234), near Seng Khola (3810).
var. **albidus** Melderis in Appendix, p. 697.

Distribution: W. Himalaya.

Exsicc.—V. Jacquemont 1638, W. Himalaya: Kunawur, Soongnam.

4. **Elymus sibiricus** Linn., Sp. Pl. ed. 1, 83 (1753).
E. praetervisus Steud., Syn. Pl. Glum. 1, 348 (1854).
E. Krascheninnikovii Roshev. in Bull. Jard. Bot. Acad. Sc. U.R.S.S. 30, 780 (1932).
Clinelymus sibiricus (Linn.) Nevski in Bull. Jard. Bot. Acad. Sc. U.R.S.S. 30, 641 (1932).

Distribution: Volga-Kama region in the European part of the U.S.S.R., Central Asia, Himalayas, Eastern Turkestan, Siberia, Mongolia, China, Japan.

Exsicc.—Stainton, Sykes and Williams 2057, Nepal: Muktinath, open slopes; Polunin, Sykes and Williams 4774, Nepal: Giri Daha, S. of Jumla, growing in sand beside river.

Eremopyrum (Ledeb.) Jaub. et Spach, Ill. Pl. Orient. 4, 26 (1851)

Key to the species of *Eremopyrum*

1. Glumes shorter than the spikelet, gradually tapering, sharp-pointed or with a short awn up to 2 mm long *E. buonapartis* see added
1. Glumes as long or nearly as long as the spikelet, with an awn 4–8 mm long:—
 2. Spikes elliptic-ovate, 0.9–1.6 cm wide; glumes lanceolate, bent, hairy as are the lemmas, with an awn 4–6 mm long *E. orientale*
 2. Spikes oblong-ovate, 1.4–2.5 cm wide; glumes linear-lanceolate, slightly bent, densely hairy as are the lemmas, with an awn 6–8 mm long *E. distans*
1. **Eremopyrum buonapartis** (Spreng.) Nevski in Komarov, Fl. U.R.S.S. 2, 663 (1934).
Triticum Buonapartis Spreng., Erst. Nachtr. Bot. Gart. z. Halle. 40 (1801).
Agropyrum Buonapartis Th. Dur. et Schinz, Consp. Fl. Afric. 5, 936 (1895).

Key to the varieties of *E. buonapartis*

1. Glumes distinctly shorter than the spikelet, gradually tapering, sharp-pointed, not awned:—
 2. Lemmas glabrous on the back, slightly scabrous near the tip; glumes scabrous on the keel var. *buonapartis*
 2. Lemmas and glumes with rigid bristles or hairy var. *sublanuginosum*
1. Glumes slightly shorter than the spikelet, with an awn 1–2 mm long, glumes and lemmas with rigid bristles var. *pakistanicum*

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Henrardia C. E. Hubbard in *Blumea*, Suppl. 3, 15 (1946).

Key to the varieties of *Henrardia persica*

1. Spikes very densely hairy with minute appressed hairs var. *persica*
1. Spikes glabrous var. *glaberrima*

1. **Henrardia persica** (Boiss.) C. E. Hubbard in *Blumea*, Suppl. 3, 17 (1946).

var. *persica*.

Lepturus persicus Boiss., Diagn. sér. 1, 13, 71 (1853).

Lepturus incurvatus (Linn.) Trin. var. *erectus* Griseb. in Ledeb., Fl. Ross. 4, 325 (1852).

L. hirtulus Regel in Act. Hort. Petrop. 7, 576 (1881).

L. pubescens (Bertol.) Boiss. var. *persicus* (Boiss.) Bern. ex Bornm. in Verh. K.K. Zool.-Bot. Ges. Wien 60, 191 (1910).

Pholiurus persicus (Boiss.) A. Camus in Ann. Soc. Linn. Lyon n.s. 69, 90 (1922).

Lepturus erectus Szovitz ex Roshevitz, Consp. Gram. Turkest. 81 (1923).

Distribution: Baluchistan, westwards to Turkey.

Exsicc.—*Stocks* 1138, Baluchistan; *Aitchison* 409, Afghanistan.

var. *glaberrima* (Hausskn.) C. E. Hubbard loc. cit. 19.

Lepturus persicus Boiss. var. *glaberrimus* Hausskn. ex Bornm. in Mitteil. Thüring. Bot. Ver. n.s. 20, 51 (1904–5).

Pholiurus glabriglumis Nevski in Act. Univ. Asiae Med. ser. 8b, Bot., fasc. 17, 35 (1934); et in Komarov, Fl. U.R.S.S. 2, 589 (1934).

Distribution: Probably the same as for the type.

Exsicc.—*Griffith* 514 (partim) Afghanistan; *Aitchison* 409, ibidem.

Heteranthelium Hochst. in Kotschy, Pl. Alepp.

exsicc., cum descriptione no. 130 (1843): et ex Jaub. et

Spach, Ill. Pl. Orient. 4, 24 (1850).

1. **Heteranthelium piliferum** (Banks et Soland.) Hochst. in Kotschy, Pl. Alepp. exsicc., no. 130 (1843).

Elymus pilifer Banks et Soland. ex Russell, Nat. Hist. Alepp. ed. 2, 2, 244 (1794).

Triticum olgae Regel in Ann. Hort. Petrop. 7, 588 (1880).

Agropyron piliferum (Banks et Soland.) Benth. ex Aitch. in Trans. Linn. Soc. 3, 126 (1888).

Heteranthelium hermoneum Gandoger in Bull. Soc. Bot. France 1919 66, 300 (1920).

Distribution: Tianshan, Tashkent, Iraq, Afghanistan, Baluchistan.

Exsicc.—*J. J. Norris* 68, Baluchistan, Quetta.

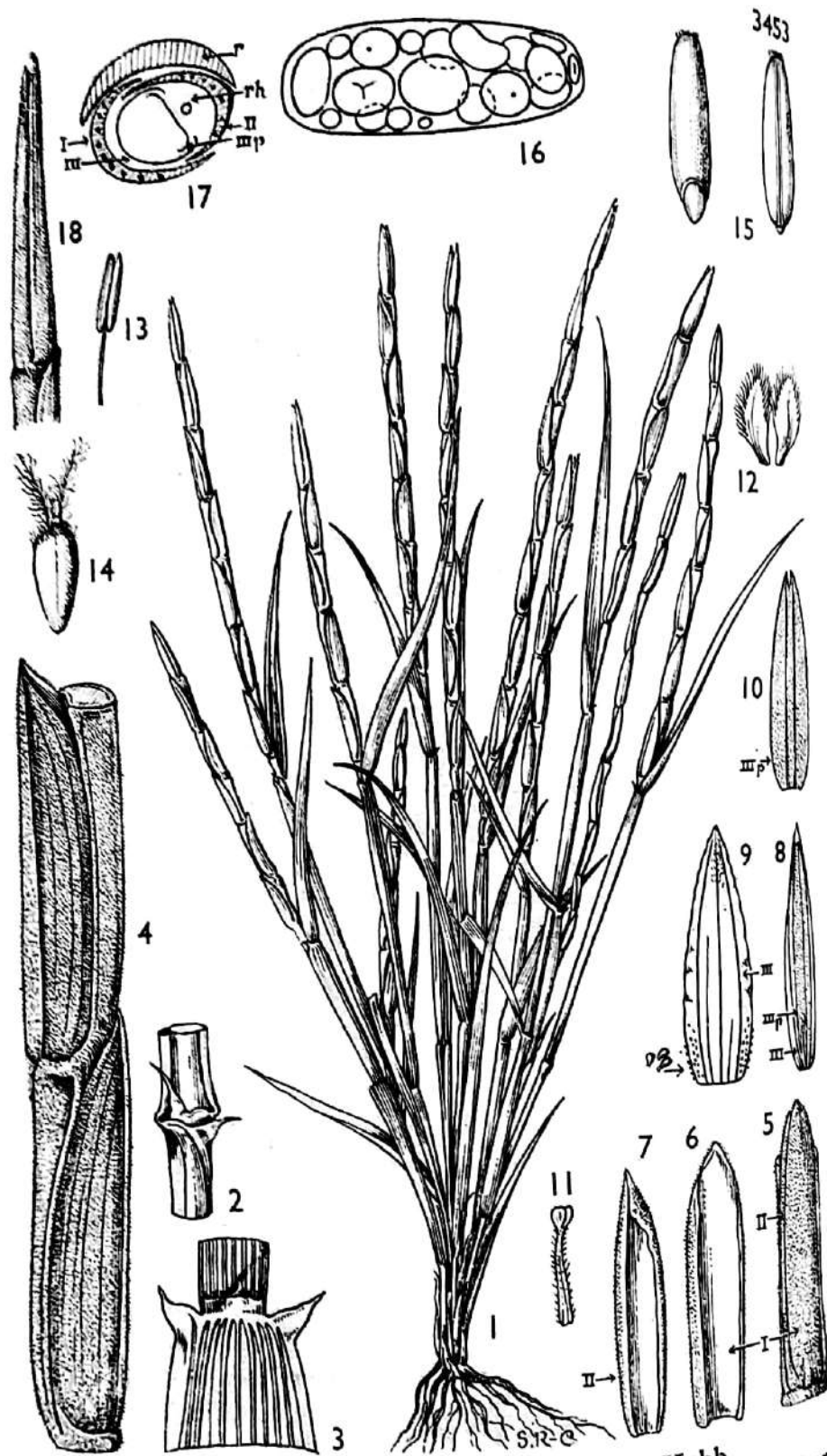


Fig. 79. *Henrardia persica* (Boiss.) C. E. Hubb.
 1, plant; 2, auricles; 3, ligule and auricles; 4, part of spike; 5, lateral spikelet;
 6, lower glume; 7, upper glume; 8, front view of floret; 9, lemma; 10, palea, all
 $\times 4$; 11, prolongation of rhachilla; 12, lodicules; 13, stamen $\times 6$; 14, ovary $\times 6$;
 15, caryopsis; 16, starch grains in cell; 17, diagram of lateral spikelet; 18, terminal
 spikelet $\times 4$ (I = lower glume, II = upper glume, III = lemma, IIIp = palea,
 r = rhachis, rh = rhachilla).

Hordeum Linn., Gen. Pl. ed. 5, 37 (1754) et in
Sp. Pl. ed. 1, 84 (1753).

Key to the species of *Hordeum*

1. Wild grasses, i.e. with the axis readily disarticulating at maturity; florets falling:—
 2. Awns over 6 cm long:—
 3. Spike with 6 rows of fertile spikelets *H. agriocrithon*
 3. Spike with 2 rows of fertile spikelets *H. spontaneum*
 2. Awn much shorter than 6 cm long:—
 4. Glumes glabrous but scabrid; awns up to 1 cm long, usually less:—
 5. Spikes usually 2.5–5 cm long, dark or greenish-purple, with the central axis very fragile; lemma of the central spikelet mucronate or with a short awn 1–2 mm long *H. turkestanicum*
 5. Spikes usually more than 5 cm long, green or slightly tinged with purple; central axis of the spike less fragile; lemma of the central spikelet with an awn 5–9(10) mm long *H. bogdanii*
 4. Glumes of the central spikelet of each trio ciliate on the margins, wider than those of lateral spikelets; awns longer than 1 cm:—
 6. Central floret pedicelled:—
 7. Spike very dense; rhachis with ciliate margins; cilia 0.25–0.75 mm long; prolongation of rhachilla of lateral spikelets 1.0–2.2 mm long, rather stout; stamens of central florets enclosed; anthers 0.2–0.5 mm long, entire or shortly lobed at the base; filaments not coloured in iodine solution; diploid *H. glaucum*
 7. Spike not very dense; rhachis scabrid on the margins or with cilia 0.1–0.3 mm long; prolongation of the rhachilla of the lateral spikelets 2.8–3.7 mm long, rather slender; stamens of central florets exerted at anthesis; anthers 0.8–1.5 mm long, deeply bilobed at the base; filaments colouring blue with iodine solution; tetraploid *H. leporinum*
 6. Central floret sessile *H. murinum*
 1. Cultivated grasses, i.e. with the central axis tough; florets persisting:—
 8. Lateral spikelets barren; spike with two rows of fertile spikelets *H. distichon*
 8. Lateral spikelets fertile; spike with 6 rows of fertile spikelets:—
 9. Tip of the lemma produced into a dilated trifid appendage with the lateral lobes deflexed *H. aegiceras*
 9. Tip of the lemma not so produced *H. vulgare*
1. ***Hordeum aegiceras*** Nees ex Royle, Illustr. Bot. Himal. 418 (1839), t. 97, f. 2.
H. coeleste trifurcatum Schlecht. in Linnaea 11, 543 (1837).
H. vulgare Linn. var. *aegiceras* (Nees) Aitch., Cat. Punj. Pl. 171 (1869).

Distribution: Tibet, Mongolia to northwest India.

Exsicc.—*Royle* s.n., northwest India; *T. Thoms.* s.n., northwest India.

2. ***Hordeum agriocrithon*** Åberg in Ann. Agr. Coll. Sweden 6, 159 (1938).

Distribution: China and Tibet. $2n = 14$.

It is possible that this wild barley will be found in Sikkim. It is believed by some authorities to be the ancestral form of the cultivated barleys.

3. ***Hordeum bogdanii*** Wilensky in Izv. Saratovsk. Op. Stan. 1, 13 (1918).

Distribution: Eastern S. Europe, south-eastern part of W. Siberia, Aralo-Caspia and Balkash areas, Tianshan, Eastern Turkestan to Mongolia.

Exsicc.—*Schlagintweit* 5750, Tibet (Prov. Balti).

4. ***Hordeum distichon*** Linn., Spl. Pl. ed. 1, 85 (1753).

Zeocricon distichum (Linn.) P. Beauv., Ess. Agrost. 115, 182 (1812).

Distribution: Europe, Palestine, Mesopotamia, Abyssinia to northwest India. $2n = 14$.

Exsicc.—*Henderson* 586, Yarkhand; *Aitchison* 1148, Afghanistan.

This barley is largely cultivated in Khorasan, etc., without irrigation below 3000 ft, above this altitude with irrigation. It is said to take only three months to ripen and is therefore sometimes raised as a second crop.

5. ***Hordeum glaucum*** Steud., Syn. Pl. Glum. 1, 352 (1854).

H. stebbinsii Covas in Madroño 10, 17 (1949).

Distribution: Northwest India to the Mediterranean Region, U.S.A. (introduced). $2n = 14$.

Exsicc.—*Lt. Harris* 16830, Chitral; *R. R. Stewart* 9617, Murree.

6. ***Hordeum leporinum*** Link in Linnaea 9, 133 (1835).

H. pseudomurinum Tapp. in Koch, Syn. ed. 2, 955 (1845).

H. rubens Willk. in Linnaea 40, 13 (1876).

H. ambiguum Doell in Mart., Fl. Bras. 2, 3, 231 (1880).

H. murinum var. *leporinum* Richt., Pl. Eur. 1, 130 (1890).

Distribution: Mediterranean Region extending to northwest India. $2n = 28$.

Exsicc.—*G. A. Gammie* s.n., Kashmir; *Jacquemont* 641, Kashmir.

7. ***Hordeum murinum*** Linn. Sp. Pl. ed. 1, 85 (1753).

Triticum murale Salisb., Prodr. Stirp. 27 (1796).

Zeocricon murinum (Linn.) P. Beauv., Ess. Agrost. 115, 182 (1812).

Distribution: Western and Southern Europe, extending to Southeast Asia. $2n = 28$ (Tateoka).

8. ***Hordeum spontaneum*** Koch in Linnaea 21, 430 (1848).

H. ithaburensense Boiss., Diagn. sér. 1, 13, 70 (1853).

Distribution: Middle East, through Iran to northwest India.

Exsicc.—*Aitchison* 465, Afghanistan—"very characteristic of the rolling

downs, grows in great clumps up to 3 ft in height. In habit it resembles cultivated barley"; *Stocks* 1062, Quetta, Baluchistan.

9. ***Hordeum turkestanicum*** *Nevski* in Act. Univ. As. Med. sér. 8b, Fasc. 17, 45 (1934).

Distribution: Pamir Alai, Tianshan, Dzeungaro-Tarbagatai, Eastern Turkestan, Himalaya.

Exsicc.—*T. Thompson*, W. Tibet; *Koelz* 2686, Kashmir; *Stainton, Sykes and Williams* 806, 1210, 2016, Nepal; *Alcock* 17791, Deasy, Pamir.

✓ 10. ***Hordeum vulgare*** *Linn.*, Sp. Pl. ed. 1, 84 (1753).

Cultivated everywhere in suitable climates. $2n = 14, 28$.

Hystrix *Moench*, Meth. 294 (1794).

1. ***Hystrix duthiei*** (*Stapf*) *Bor* in Indian For. 66, 544 (1940).

Asperella duthiei *Stapf* ex *Hook. f.*, Fl. Brit. Ind. 7, 375 (1896).

Distribution: Himalayas, China.

A forest grass above 2000 m.

Exsicc.—*J. F. Duthie* 19813, Tehri; *J. S. Gamble* 26758; *J. F. Duthie*, N.W. Himalaya, Cháchpur Valley; *Stainton, Sykes and Williams* 3030, Nepal: south of Gurjakhani.

Secale *Linn.*, Gen. Pl. ed. 5, 36 (1754) et in Sp. Pl. ed. 1, 84 (1753).

Key to the species and varieties of *Secale*

Plants perennial; lemma 3 mm longer than the glumes; awn as long as the lemma *S. montanum*

Plants annual:—

Rhachis very brittle

S. afghanicum

Rhachis tough

S. cereale

1. ***Secale afghanicum*** (*Vavilov*) *Roshev.* in Act. Inst. Bot. Acad. Sci. U.R.S.S. sér. 1, fasc. 6, 139 (1947).

S. cereale var. *afghanicum* *Vavilov* in Bull. Appl. Bot. 16, fasc. 2, 77 (1926).

Distribution: Afghanistan.

Exsicc.—*Aitchison* 442, Afghanistan: "A weed amongst wheat, in some fields in such quantity that there is as much rye as wheat. It is considered very hurtful to the system when a large amount of it is mixed with wheat-flour. Perfectly wild, and not grown anywhere as a distinct crop."

2. ***Secale cereale*** *Linn.*, Sp. Pl. ed. 1, 84 (1753).

Triticum cereale *Salisb.*, Prodr. Stirp. 27 (1796).

Cultivated in north-west India in, for example, Lahul, but certainly cultivated elsewhere in the Himalaya.

3. **Secale montanum** Guss., Ind. Sem. Hort. Boccad. 1825: Prodr. Fl. Sic. 1, 145 (1827).
 Distribution: Chitral, Orient, Morocco, South and Central Europe.
 Exsicc.—Lt. Harris, Chitral.

Taeniatherum Nevski in Act. Univ. As. Med.
 sér. 8b, Bot. fasc. 17, 38 (1934).

1. **Taeniatherum crinitum** (Schreb.) Nevski in Act. Univ. As. Med.
 sér. 8b, Bot. Fasc. 17, 38 (1934).

Elymus crinitus Schreb., Besch. Graes. 2, 15 (1777), t. 24, f. 1.

Hordeum crinitum Desf., Fl. Atlant. 1, 113 (1798).

Elymus intermedius M.B., Fl. Taur.-Cauc. 1, 82 (1808).

E. caput-medusae Boiss., Fl. Orient. 5, 691 (1884) non Linn. (1753).

Distribution: From North Africa to Baluchistan.

Exsicc.—J. J. Norris 62, Quetta.

Triticum Linn., Gen. Pl. ed. 5, 37 (1754) et in
 Sp. Pl. ed. 1, 85 (1753).

1. Teeth of the glumes acute or acuminate, stiff; mature palea divided into two halves; apical spikelet aborted *T. monococcum*

1. Teeth of the glumes acutish, obtuse, rounded or absent; palea entire; apical spikelet developed and fertile:—

2. Glumes shorter than any of the lemmas, chartaceous; palea of the lowest lemma as long as the lemma:—

3. Rhachis brittle at maturity; grain entirely enclosed between the lemma and the palea (but not adherent) and not removed by threshing:—

4. Spikes loose, 12–20 cm long, 8–9 mm wide, almost 4-sided when seen from above; glumes broadly truncate, with a very short, obtuse, middle tooth; shoulders of glumes horizontal; back of the glumes obtusely but definitely keeled *T. spelta*

4. Spikes 5–12.5 cm long, 0.8–1.2 cm wide, with crowded spikelets, laterally compressed; glumes tapering, with an acute middle tooth, sharply keeled; rhachis visible from the side where the spikelets are in two rows, not readily breaking up but yielding to pressure *T. dicoccum*

3. Rhachis tenacious at maturity; grain easily separating from the gaping lemma and palea:—

5. Glumes rounded or distinctly keeled only in the upper half, rounded or only slightly keeled in the lower half:—

6. Spikes long, more or less loose, somewhat dorsally compressed, 6–18 cm long; glumes sharply keeled above *T. aestivum*

6. Spikes short, 4–7 cm long, dense, distinctly 4-sided, 4–6 cm long; glumes not keeled but rounded, awnless or with a very short awn *T. sphaerococcum*

5. Glumes sharply keeled at the base:—

7. Spikes short, fat, 9–11 cm long, 1–1.5 cm wide, broadly truncate above, often branched; grain short, thick, not compressed, broadly truncate above, mealy; leaves very hairy *T. turgidum*

7. Spikes usually somewhat longer, 4–13 cm long, 1–2 cm wide, slightly compressed from the sides, pointed above; grain oblong, narrow, somewhat laterally compressed and acuminate, flinty; leaves glabrous or slightly hairy *T. durum*

2. Glumes as long as or longer than any of the lemmas, papery, lanceolate; palea of the lower floret half as long as its lemma; spikes 10–20 cm long, 1–2 cm wide *T. polonicum*

- ✓ 1. ***Triticum aestivum* Linn.**, Sp. Pl. ed. 1, 85 (1753).

T. hybernum Linn., Sp. Pl. 86 (1753).

T. compositum Linn., Syst. Veg. ed. 13, 108 (1774).

T. sativum Lamk., Fl. Franç. 3, 625 (1778).

T. vulgare Vill., Hist. Pl. Dauph. 2, 153 (1787).

Distribution: Widely cultivated in all parts of the world. $2n = 48$.

- ✓ 2. ***Triticum dicoccum* Schübler**, Char. et Descr. Cerealium in Hort. Tübing. 29 (1818).

T. spelta Host, Gram. Austr. 3, 21 (1805), t. 30, non Linn. (1753).

T. sativum dicoccum Hack. in Natürl. Pflanzenf. 2, 2, 81, 84 (1887).

Distribution: Widely cultivated. $2n = 28$ (var. *indicum*).

Exsicc.—*Saulière* 652, Pulneys, Madras; *Bhatia* 18, Madhya Pradesh (var. *ajar*); *Bhatia* s.n., Madhya Pradesh.

- ✓ 3. ***Triticum durum* Desf.**, Fl. Atlant. 1, 114 (1798).

Distribution: Commonly cultivated in many countries of the world. $2n = 28$.

Exsicc.—*Bhatia* 7, Madhya Pradesh; *Stocks* s.n., Sind.

4. ***Triticum monococcum* Linn.**, Sp. Pl. ed. 1, 86 (1753).

Nivieria monococca Ser., Cér. Eur. 111, 114 (1841).

Distribution: Cultivated by primitive peoples over a wide area.

Percival states that the awns and thick glumes protect it from birds, and that it will grow on poor sandy, chalky and rocky soils.

5. ***Triticum polonicum* Linn.**, Sp. Pl. ed. 2, 127 (1762).

T. levissimum Hall., Stirp. Ind. Helv. 209 (1768).

T. glaucum Moench, Method. 174 (1794).

Distribution: Mediterranean Region, South Russia, Northern Assam.

Exsicc.—*Walton* s.n., Tsangpo, Brahmaputra Valley. $2n = 28$.

6. ***Triticum spelta* Linn.** Sp. Pl. ed. 1, 86 (1753).

T. zeo Host, Gram. Austr. 3, 20 (1805).

Distribution: Cultivated to some extent in Western Europe. Introduced into India for breeding purposes. $2n = 42$.

7. **Triticum sphaerococcum** *Percival*, Wheat Plant, 321 (1921).

Distribution: Punjab, Madhya Pradesh, endemic. $2n = 48$.

Exsicc.—Sheets of this species grown by Percival at Reading, from seed obtained from India.

8. **Triticum turgidum** *Linn.*, Sp. Pl. ed. 1, 86 (1753).

Distribution: Cultivated in Mediterranean countries, Caucasus, Baluchistan and northwest India. $2n = 28$.

Exsicc.—Northwest India without collector's name or locality.

POOIDEAE—ZOYSIEAE

ZOYSIEAE *Miq.*, Fl. Ind. Bat. 3, 365 (1857) emend. Stapf in Dyer, Fl. Cap. 7, 315 (1898) partim

Spikelets all alike, hermaphrodite, or rarely in groups with some of the spikelets male, 1-flowered; rhachilla disarticulating below the floret, not produced beyond the floret; spikelets falling entire, either singly or in groups of 2–5. Glumes equal or the lower suppressed; the lower sometimes with a globose base and a cymbiform limb, keeled, with a cartilaginous wing, the upper coriaceous, rarely keeled and winged; lemma hyaline, much smaller than and enclosed by the glume or glumes; palea broad or narrow, hyaline. Lodicules absent or 2. Stamens 3 or 2; anthers small or long. Ovary glabrous; styles 2; stigmas plumose. Grain free between the lemma and palea; hilum punctiform.

Annual or perennial herbs. Leaf-blades flat or wiry, rigid, rarely flat, usually subulate or convolute, with panicoid anatomy; silica-cells saddle-shaped; 2-celled micro-hairs swollen. Spikelets arranged in narrow spikes or subspiciform racemes. Ligules absent or a ciliate rim. First foliage leaf of the seedling spreading.

Chromosomes small; basic number 9, 10.

Genera: Hilaria

Latipes

Lopholepis

Tragus

Zoysia

Key to the genera of **Zoysieae**

1. Spikelets sessile in groups of three, the centre spikelets hermaphrodite, the two lateral male, the group falling entire **Hilaria**
1. Spikelets not arranged as above:—
 2. Spikelets minute (racemosely arranged on a long axis) exactly the shape of a bird's head in outline **Lopholepis**
 2. Spikelets not shaped like a bird's head:—
 3. Glumes of the spikelets with recurved spines or one armed and one smooth; spikelets arranged in erect racemes:—
 4. Spikelets solitary, distant on flattened wedge-shaped pedicels; lower glumes pectinately spinous, dorsally smooth; upper glume thickened, tuberculate **Latipes**
 4. Spikelets in pairs, crowded on short pedicels, face to face, lower glumes armed with hooked spines; upper glumes smooth **Tragus**
 3. Glumes of the spikelets, smooth, compressed, shining; spikelets arranged in rigid, erect spikes **Zoysia**

Hilaria H.B.K., Nov. Gen. et Sp. 1,
116 (1816), t. 37.

Pleuraphis Torr. in Ann. Lyc. New York
1, 148 (1824), t. 10.

Hexarrhena J. S. Presl ex C. B. Presl, Rel.
Haenk. 1, 326 (1830), t. 45.

Symbasiandra Willd. ex Steud., Nom. Bot.
ed. 2, 1, 767 (1840).

1. **Hilaria jamesii** (Torr.) Benth. in J. Linn. Soc. (Bot.) 19, 62 (1881).
Pleuraphis jamesii Torr. in Ann. Lyc. New York 1, 148 (1824) t. 10.
Hilaria sericea Benth. in J. Linn. Soc. (Bot.) 19, 62 (1881) nomen.
Pleuraphis sericea Nutt. ex Benth. in J. Linn. Soc. (Bot.) 19, 62 (1881)
as synonym for the preceding name.
A desert North American grass introduced into India.

Latipes Kunth, Rév. Gram. 1, 261 (1830), t. 42.

1. **Latipes senegalensis** Kunth, Rév. Gram. 1, 261 (1830), t. 42.
Lappago latipes Steud., Syn. Pl. Glum. 1, 112 (1854).
Tragus senegalensis Gay ex Kunth, Enum. Pl. 1, 171 (1833) nomen.
T. latipes Gay ex Kunth, loc. cit. 171, nomen.

Distribution: Desert areas of North Tropical Africa, Iraq, Persia to Sind.

This grass forms flat cushions or caespitose bunches in hot desert areas. It is grazed by all stock.

Exsicc.—R. R. Stewart 24799, Karachi; Stocks 1186, Sind.

Lopholepis Decne. in Archiv. Mus. Hist. Nat. Paris
1, 147 (1839).

1. **Lopholepis ornithocephala** (Hook.) Steud., Syn. Pl. Glum. 1, 112 (1854).

Holboellia ornithocephala Hook., Bot. Misc. 2, 144 (1831), t. 76.

Distribution: Ceylon and South India.

This is perhaps the most extraordinary grass of all the species to be found in our area. The spikelet has an almost comical resemblance to a bird's head.

Exsicc.—Herb. Wight., Palmacotta, Tinevelly, Tuticorin; Trimen s.n., Ceylon.

Tragus [Hall., Hist. Stirp. Helv. 2, 203 (1768)]
Scop., Intr. 73 (1777), nomen genericum conservandum.
Nazia Adans., Fam. 2, 31 (1763).

- ✓ 1. **Tragus biflorus** Schult., Syst. Veg. 2, Mant. 205 (1824).
Lappago biflora Roxb., Fl. Ind. 1, 284 (1820).

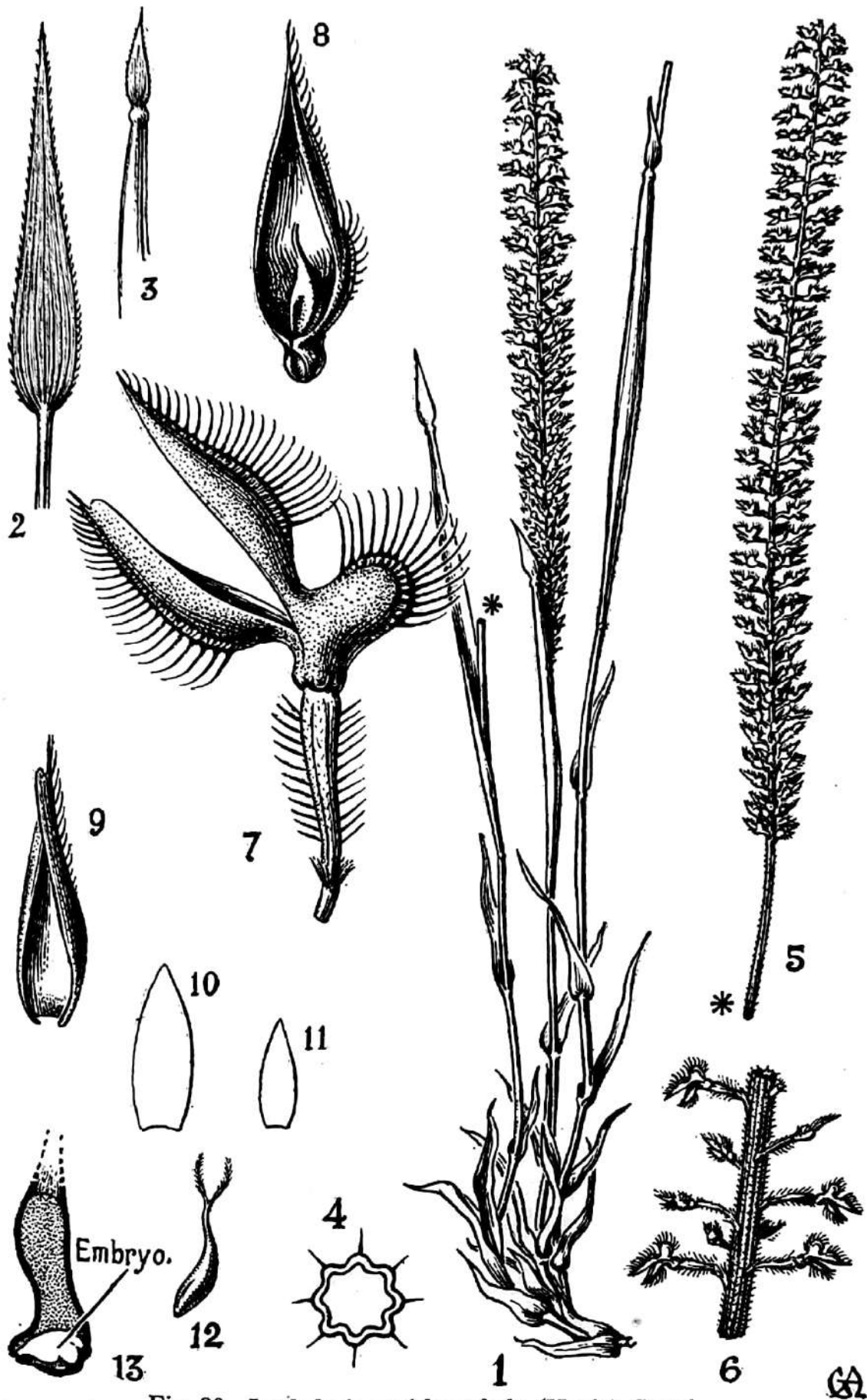


Fig. 80 *Lopholepis ornithocephala* (Hook.) Steud.
 1, plant $\times 1$; 2, leaf-blade $\times 2$; 3, uppermost leaf-blade $\times 2$; 4, section of stem below inflorescence $\times 10$; 5 inflorescence $\times 1$; 6, portion of the inflorescence showing rhachis $\times 3$; 7, spikelet $\times 18$; 8, lower glume from the inside; ovary very young $\times 18$; 9, upper glume from the inside $\times 18$; 10, lemma $\times 18$; 11, palea $\times 18$; 12, young ovary, styles and stigmas $\times 48$; 13, longitudinal section of the grain $\times 24$.

Tragus racemosus of the Flora of British India 7, 97 (1896) non Scop. (1777).

Distribution: Southeast Asia and East Africa.

This species is said to be common in the plains of India and to be browsed by stock.

Exsicc.—R. R. Stewart 10145, Rawalpindi; G. A. Gammie s.n., Kashmir; Jacquemont 386, Poona; C. E. C. Fischer 2148, Madras.

Zoysia Willd. in Neue. Schr. Ges. Naturf. Fr. Berlin

3, 440 (1801), nomen genericum conservandum.

Osterdamia Neck., Elem. 3, 218 (1791).

Key to the species of *Zoysia*

1. Rhizomatous, with rhizomes below the surface:—

2. Leaves flat, 2–4 mm wide; racemes 3.5–5 mm wide; spikelets 3 mm long, over 1 mm wide *Z. japonica*

2. Leaves narrower, usually folded; racemes not more than 3 mm wide; spikelets usually green or pale *Z. matrella*

1. Stoloniferous or if rhizomatous, rhizomes close to the surface; racemes narrow; leaves very numerous, involute, capillary; spikelets less than 1 mm broad *Z. tenuifolia*

1. *Zoysia japonica* Steud., Syn. Pl. Glum. 1, 414 (1855).

Osterdamia japonica (Steud.) Hitchc. in U.S. Dept. Agr. Bull. 772, 166 (1920).

Introduced from Japan into the U.S.A. and from there into India. It may be found as an escape. This is said to be a good lawn grass.

✓ 2. *Zoysia matrella* (Linn.) Merr. in Philipp. Jour. Sci. Bot. 7, 230 (1912). *Agrostis matrella* Linn., Mant. Pl. 2, 185 (1771).

Zoysia pungens Willd. in Ges. Naturf. Freunde Berlin, Neue Schr. 3, 441 (1801).

Osterdamia matrella (Linn.) O. Ktze., Rev. Gen. Pl. 2, 781 (1891).

Distribution: Widely distributed in the tropics of Asia, introduced into America.

This is a useful lawn grass and sand-binder. It is common on the seashores of India.

Exsicc.—Thwaites C.P. 948, Ceylon; J. S. Gamble 20802, Madras.

3. *Zoysia tenuifolia* Willd. ex Trin. in Mém. Acad. Sci. Pétersb. sér. 6, 4, 96 (1836).

Introduced into Florida and California, U.S.A., from the East, and from there into India. It may be found as an escape. Reputed to be excellent for lawns.

APPENDIX

Nomina taxorum graminum novorum Indiae incolarum

Tribus Novae

Aristideae C. E. Hubbard

Aristideae C. E. Hubbard, tribus nova *Graminearum*. *Spiculae* omnes similes, hermaphroditae, 1-flores; *rhachilla* supra glumas articulata, supra anthoecium haud producta. *Glumae* scariosae, persistentes, aequales vel inaequales (inferior quam superiorem raro longior) muticae, mucronatae interdum aristatae; *lemma* arcte convolutum, teres, chartaceum, demum coriaceum, 3-nerve, apici bifidum vel acutum, callo barbato pungente rarissime bifurcato; arista trifida vel 3-partita cum lemmate sine columnam continua vel columna cum lemmate articulata et apici trifida; columna torta vel recta; rami aristae omnes plumosi vel laterales vel omnes glabri; rami laterales rarissime obsoleti; *palea* hyalina, lemmate brevior. *Lodiculae* 2. *Stamina* 3. *Ovarium* glabrum; *styli* duo, breves; *stigmata* plumosa. *Caryopsis* gracilis, teres, lemmate paleaque arcte complectata; *hilum* lineare, caryopsidem aequans; *embryo* brevis vel longus.

Gramina annua vel perennia, caespitosa; *foliorum laminae* crebro convolutae, anatomia panicoidea; *cellulae* siliceae halteriformes vel oblongae; pili unicellulares vel bicellulares; *ligula* ad seriem pilorum redacta. *Spiculae* pedicellatae, in paniculas effusas interdum racemiformes dispositae.

Species numerosae.

Type species: *Aristida adscensionis* Linn.

Hubbardieae C. E. Hubbard

Hubbardieae C. E. Hubbard, tribus nova *Graminearum*. *Spiculae* omnes similes, teretes, biflores; *anthoecium* inferius vacuum, superius hermaphroditum; *rhachilla* inter glumam superiorem et anthoecium inferius articulata. *Glumae* spiculae aequilongae, membranaceae, persistentes, 5-7-nerves. *Lemma* inferius spiculae aequilongum, tenue, 7-9-nerve, vacuum, sine palea; *lemma* superius simile, hermaphroditum, sine palea. *Lodiculae* 2, cuneatae, glabrae. *Stamina* 3. *Caryopsis* fusiformis, libera; *hilum* breve, lineare, basale; *embryo* tertiam partem caryopsidis aequans; *amyli* granula composita.

Herba annua; *foliorum laminae* tenuissimae, anguste ellipticae; *cellulae* siliceae quadratae. Pili bicellulares absunt. *Ligula* nulla.

Species adhuc unica, Indiae incola.

Type species: *Hubbardia heptaneuron* Bor.

Perotideae C. E. Hubbard

Perotideae C. E. Hubbard, tribus nova *Graminearum*. *Spiculae* omnes similes, hermaphroditae, 1-flores; rhachilla infra glumas articulata, supra anthoecium haud producta. *Glumae* subaequales, 1-nerves, acuminatae, in aristas longas capillares productae; *lemmata* hyalina, exaristata, quam glumas multo breviora; *palea* hyalina, binervis, minuta. *Stamina* 3. *Ovarium* glabrum; *styli* duo, breviter connati; *stigmata* brevia. *Caryopsis* linearis, teres, glumis aequilonga, inter eas libera; *embryo* tertiam partem caryopsidis aequans.

Herbae annuae vel perennes; *foliorum laminae* planae, ovato-cordatae, latae; anatomia panicoidea; *cellulae* siliceae halteriformes; pili bicellulares, cellulis terminalibus hemisphaericis; *ligulae* membranaceae, ciliatae. *Spiculae* in spicas simpliciter racemosas terminales dispositae.

Species 12-13, veteris orbis regionum tropicarum incolae.

Type species: *Perotis indica* (Linn.) O. Ktze.

Pommereulleae N. L. Bor

Pommereulleae N. L. Bor, tribus nova *Graminearum*. *Spiculae* turbinatae, 2- bis 3-flores, hermaphroditae; *anthoecia* hermaphrodita, 1-2 lemmatibus vacuis suffulta; *rhachilla* supra glumas articulata, valida, obconica, callo similis, inter anthoecia continua, producta et apice anthoecio imperfecto coronata. *Glumae* persistentes, angustae vel panduriformes, marginibus late hyalinae, inferior 1-nervis, superior 3-nervis. *Lemmata* vacua, late elliptica, basi contracta, tomentosa, 4-lobata, 7-9-nervia, dorso aristata; loborum nervi rare in aristas producti; *anthoeciorum* lemmata 3-lobata, coriacea, dorso aristata; *palea* binervis. *Stamina* 2-3; *styli* 2; *stigmata* plumosa. *Lodiculae* 2, membranaceae. *Caryopsis* obovato-elliptica; *hilum* punctiforme; *embryo* tres quadrentes caryopsidis aequans.

Herba perennis, stolonifera; *foliorum laminae* loriformes, anatomia panicoidea; *cellulae* siliceae ephippioideae; *ligula* est annulus ciliatus; pili inflati, bicellulares. *Inflorescentia* racemosa vagina summa ad dimidiam partem obsecta.

Species adhuc unica, Indiae incola.

Type species: *Pommereulla cornucopiae* Linn.f.

Genus Novum**Hemisorghum C. E. Hubbard**

Hemisorghum C. E. Hubbard. Genus novum *Sorgho* Moench affine, sed rhacheos internodiis et pedicellis serrato-scabridis; *gluma* inferiore spiculae sessilis bicarinata carinis serrato-scabridis; *lemmate* superiore mutico; *lodiculis* glabris; *spiculis* pedicellatis sterilibus valde redactis differt.

Spikelets paired, those of each pair differing in shape and sex, with one sessile and the other pedicelled at each node of the tardily disarticulating rhachis of few- to several-noded spike-like racemes, the racemes borne on

the slender triquetrous or angular scabrid branches of profusely branched effuse panicles, the sessile spikelets falling at maturity with the contiguous internode of the rhachis and the pedicelled spikelet; pedicels and internodes similar, equal or nearly so, slender, triquetrous or the former compressed, serrately scabrid on the angles. *Florets* 2: lower barren and reduced to the lemma or usually absent in the pedicelled spikelets; upper ♀ in the sessile spikelets, absent in the pedicelled. *Sessile spikelets* dorsally compressed, lanceolate to oblong-lanceolate, obtuse, awnless, contiguous to slightly imbricate; callus truncate, extremely short, bearded with a ring of minute hairs. *Glumes* dissimilar, equal or nearly so; lower lanceolate, obtuse, flat or slightly convex on the back in the lower part, 2-keeled throughout, with narrow inflexed margins, closely serrately scabrid on the keels, coriaceous in the lower half, thinner above, 8-11-nerved, with 4 to 7 intercarinal nerves; upper lanceolate, acute, rounded on the back below the middle, slightly keeled towards the apex, coriaceous below, thinner upwards, with membranous ciliate margins, 7-nerved. *Lower lemma* slightly shorter than the glumes, lanceolate-oblong, obtuse, thinly membranous, hyaline, faintly 2-nerved, ciliate; *palea* absent. *Upper lemma* nearly as long as the lower and similar in texture, oblong-lanceolate or narrowly ovate, entire or minutely 2-lobed, finely 1-nerved, with the nerve sometimes produced as a minute mucro between the lobes, ciliate; *palea* as long as the lemma, similar in texture, linear-oblong, nerveless. *Lodicules* very small, quadrate, truncate, brown or purple, glabrous. *Stamens* 3; anthers narrowly oblong. *Ovary* glabrous; styles 2; stigmas densely plumose, laterally exserted, purplish. *Caryopsis* obovate-oblong, dorsally compressed, plano-convex, hard, tipped with the connate style-bases; embryo about half the length of the caryopsis; hilum basal, orbicular to oblong. *Pedicelled spikelets* barren, linear to narrowly lanceolate, smaller than the sessile. *Lower glume* linear to narrowly lanceolate, 2-keeled, scabrid on the keels, 5-8-nerved. *Upper glume* slightly to much shorter than the lower, narrowly lanceolate-oblong, keeled on the back towards the apex, membranous, 5-nerved. *Lower lemma* much reduced or absent.

Tufted perennial (?); culms tall, stout, erect, solid, terete, simple or sparingly branched; leaf-blades lanceolate-linear, broad, flat; ligules very short, truncate, densely short-ciliate; panicles large, loose, with numerous verticillate branches.

***Hemisorghum mekongense* (A. Camus) C. E. Hubbard, comb. nov.**

Sorghum halepense (L.) Pers. var. *mekongense* A. Camus in Bull. Mus. Hist. Nat. Paris, 25: 497 (1919).

Sorghum mekongense (A. Camus) A. Camus in Lecomte, Fl. Indo-Chine, 7: 323, fig. 35 (1922); Rhind, Grasses Burma, 65 (1945); Schmidt in Agron. Tropicale, 13: 212, 214, fig. 36 (1958).

Distrib. Indo-China (Laos), Thailand, Burma; on river-banks.

Hemisorghum is restricted to the above species which may be distinguished from those of *Sorghum* subgenus *Sorghum* by the slender more loosely spiculate sessile or subsessile racemes, the slowly disarticulating

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rhachis, the closely serrately scabrid (not ciliate) internodes of the rhachis and pedicels, by the lower glumes being two-keeled to the base with the keels closely scabrid, the awnless upper lemma, glabrous (not ciliate) lodicules, and by the much reduced pedicelled spikelets.

Species, varietates hybridaeque novae

Sporobolus stocksii Bor, sp. nov. (*S. ioclados* Hook.f. non Nees).

Gramen perenne. *Culmi* caespitosi simplices, teretes, glabri, superne scaberuli. *Foliorum laminae* breves, glabrae, usque 8 cm longae, 2.5 mm latae; *vaginae* glabrae, inter nervos scaberulae, arctae, striatae; *ligula* ad seriem pilorum redacta.

Panicula usque 20 cm longa, 8 cm lata, laxa, ramis alternis, patentibus, ramulosis. *Spiculae* 2 mm longae; *gluma inferior* 0.75–1 mm longa, lanceolato-acuta, 1-nervis; *gluma superior* 1.2–1.5 mm longa, oblongo-acuta; *lemma* 1.8 mm longum; *palea* 1.5 mm longa; *stamina* 3; *antherae* 1 mm longae; *lodiculae* 2; *caryopsis* non visa.

Ind. Or.: Scind, 1848, *Dr. Stocks* s.n. (K).

Andropogon burmanicus Bor, sp. nov.

Gramen perenne. *Culmi* usque 100 cm alti, teretes, leves glabrique, nitentes. *Foliorum laminae* lineares, erectae, supra glaucae, pilis longis albis instructae, infra virides, glabrae, leves; superiores filiformes, vestigiales; *vaginae* arctae, culmos complectentes, leves glabraeque; *ligula* membranacea, angustissima.

Racemi fasciculati, subfastigiati, erecto-patuli, 5–6 cm longi; articuli pedicellique superne latiores, explanati, marginibus ciliati. *Spiculae* ad quemvis racheos nodum binae; pedicellata a pedicello, sessilis cum articulo accumbente pedicelloque demum soluta. *Spicula sessilis* 4.5 mm longa; *gluma inferior* compressa, profunde sulcata; *superior* navicularis, aristata; *anthoecium inferius* vacuum; *lemma* hyalinum oblongum; *anthoecium superius* hermaphroditum; *lemma* oblongum, curvatum apice bifidum, hyalinum, 1-nervis; nervus in aristam perfectam 20 mm longam productus; *palea* late ovato-obtusa, hyalina; *stamina* 3; *antherae* 2.5 mm longae. *Spicula pedicellata* 3.5 mm longa; *gluma inferior* elliptico-acuta, bicarinata, dorso planum, carinis ciliata; *superior* navicularis, 3-nervis, mucronata; *anthoecium inferius* vacuum; *lemma* hyalinum; *anthoecium superius* ♂; *lemma* breve, oblongum, hyalinum; *palea* brevis, ovata, hyalina; *stamina* 3; *antherae* 2 mm longae; *lodiculae* 2, parvae, cuneatae.

Ind. Or.: Burma, Salu Reserve, Pegu Division, 1939, *U Thein Lwin* s.n. (K).

✓ **Arthraxon nitidulus** Stapf mss., sp. nov., *A. breviaristato* Hack. affinis sed ab eo spiculis scabris haud muriculatis, articulis pedicellis ciliatis, antheris minoribus recedit.

Gramen annuum culmis usque 30 cm altis, nodis barbatis. *Foliorum laminae* ovato-acuminatae, 5–6 cm longae, 1.5 cm latae, basi cordatae, marginibus basin versus ciliatae; *vaginae* leves glabrae vel nonnunquam pilis e tuberculis ortis praeditae; *ligula* angusta, ciliata.

Spicae 4–6, tenues, 4–5 cm longae, irregulariter subdigitatae; *spiculae* secus rhachin articulatae spicae sessiles, cum articulo accumbente rudimentoque breve demum decedentes; articuli pedicellique ciliati. *Glumae* aequilongae, 4–5 mm longae; inferior nervis leviter scabra. *Anthoecia* duo; inferius vacuum, superius hermaphroditum, lemmate basi aristato. *Stamina* 3; *antherae* 2 mm longae; *styli* 2; *stigmata* plumosa.

Ind. Or.: Bombay, Belgaum, *Ritchie* 796a (K).

***Lophopogon duthiei* Stapf mss., sp. nov.**

L. tridentato Hack. affinis sed ab eo culmis pergracilibus ramosis, basibus haud sericeo-villosis, capitulis minoribus, pauciorispiculatis recedit.

Gramen annuum. *Culmi* usque 40 cm longi, erecti, glabri levesque, apicem versus ramosi; nodis glabri. *Foliorum laminae* filiformes usque 8 cm longae; *vaginae* glabrae levesque; *ligula* ad seriem pilorum 1 mm longorum redacta.

Racemi duo in capitulum 1 cm longum contracti; glumae spiculae inferioris 4.5 mm longae, multinervosae, glabrae. *Spiculae* hermaphroditae 6–8. *Spiculae pedicellatae* gluma inferior cirro pilorum ferrugineorum supra medium ornata.

Ind. Or.: J. F. *Duthie* 8490, Madhya Pradesh (holotypus in Herb. Kew).

***Agropyron afghanicum* Melderis, sp. nov.**

Gramen perenne. *Culmi* superne scabriusculi. *Folia* glaucescentia, firma, plana, supra nervis crassiusculis approximatis pilis brevibus tectis, subtus marginibusque scabra. *Spica* laxa, 14–16 cm longa, flavescenter viridis, erecta, rigida; rhachis costis plus minusve scabra, marginibus breviciliata scabra. *Spiculae* 1.2–1.5 cm longae, oblongo-ellipticae, 4–6-florae. *Glumae* subaequilongae (inferior 6–7 mm, superior 7–8 mm longa), firmas, oblanceolatae ad oblongo-lanceolatae, leviter carinatae, flavido-marginatae, marginibus plus minusve brevisetulosae, apice obtuso-triangularis, subito acuminatae vel mucronulatae, 4–6-nerviae, nervis plus minusve scabris. *Lemma* 8.5–9.5 mm longum, oblongo-lanceolatum, superne leviter carinatum, 5-nervium, ad margines brevisetulosum, dorso glabrum, apice rotundatum vel truncatum, mucronulatum, mucrone 0.4–0.8 mm longo. *Palea* lemmate paulo brevior, anguste lanceolata, apice emarginata, bicarinata, carinis ciliata, dorso apicem versus brevisetulosa. *Rhachilla* setulis perparvis tecta. *Antherae* flavae, 5–5.5 mm longae.

Affinis *A. intermedio* (Host) Beauv. a quo glumis marginibus plus minusve brevisetulosus saepe mucronulatis 4–6-nerviis, lemmate mucronulato ad margines brevisetuloso dorso glabro, differt.

Afghanistan: Khorasan, 16, 17, 21/6 1885, J. E. T. *Aitchison* 1145 (holotypus in Herb. Mus. Brit.).

Agropyron borianum Melderis, sp. nov.

Gramen perenne, 90–100 cm altum, caespitosum. Culmi rigidi, glabri, leves, 4-nodes. Folia viridia; vaginae inferiores plerumque dense longipilosae, superiores glabrae leves; ligulae 1 mm longae, hyalinae, apice obtusae laceratae; laminae 10–22 cm longae, 4.5–6 mm latae, planae, tenuiter nerviae, supra marginibusque sparse longipilosae, subtus glabrae leves. Spica densa, 12–17 cm longa (aristis exclusis), erecta; rhachis glabra levis sed marginibus dense ciliata scabra. Spiculae 1.2–1.6 cm longae (aristis exclusis), lanceolatae vel anguste lanceolatae, 3–5-florae. Glumae subaequilongae (inferior 7–8.5 mm, superior 8.5–10 mm longa), firmae, oblongo-ellipticae, superne leviter carinatae, hyalino-marginatae, apice plus minusve subito acuminatae, breviaristatae, arista 2–4.5 mm longa, 4–5-nerviae, nervis prominentibus scabris. Lemma 8–9.5 mm longum, firmum, oblongo-lanceolatum, ad margines apicem versus longipilosum, dorso glabrum, 5-nervium, nervis superne prominentibus, apice hyalino-marginatum saepe uni- vel bidentatum aristatum, arista 1.2–2 cm longa erecta rigida scaberrima. Palea lemmati aequilonga, anguste lanceolata, apice rotundata, bicarinata, carinis superne longiciliata, dorso apicem versus brevisetulosa. Rhachilla breviter pubescens. Antherae flavae, 4–5.5 mm longae.

Ab *A. macrolepide* Drobov glumis oblongo-ellipticis 4–5-nerviis, lemmate ad margines apicem versus longipiloso dorso glabro apice hyalino-marginato, arista brevior erecta rigida scaberrima, antheris longioribus, differt.

Swat: Kalam, 7000 ft, 24/8 1955, *A. Rahman* 229 (holotypus in Herb. Kew).

Agropyron cognatum var. **shingoense** Melderis, var. nov.

Ab *A. cognato* Hackel var. *cognato* lemmate breviaristato, arista usque ad 7 mm longa, differt.

Kashmir (Baltistan): Shingo Valley, 10,000–11,000 ft, 7/7 1893, *J. F. Duthie* 11895 (holotypus in Herb. Kew).

Agropyron dentatum var. **kashmiricum** Melderis, var. nov.

Ab *A. dentato* Hook.f. var. *dentato* glumis 3-nerviis, foliorum laminis et vaginis pubescentibus, differt.

Kashmir: *W. Munro* (holotypus in Herb. Kew).

Agropyron duthiei Melderis, sp. nov.

Gramen perenne, 40–70 cm altum, gracile, caespitosum. Culmi glabri, leves, 3–4-nodes. Folia viridia vel glaucescenter viridia; vaginae marginibus plerumque dense longiciliatae, dorso plerumque glabrae leves; ligulae 0.2–0.4 mm longae, hyalinae, apice truncatae laceratae; laminae 10–30 cm longae, 1.5–3 mm latae, planae, supra marginibusque sparse longipilosae, subtus plerumque glabrae leves, ad auriculas plerumque dense longipilosae. Spica laxiuscula, 10–18 cm longa (aristis exclusis), erecta; rhachis glabra

levis sed marginibus breviciliata scabra. *Spiculae* 1.5–2 cm longae (aristis exclusis), anguste lanceolatae, virides vel leviter purpureo-tinctae, 3–5 (6)-florae, flosculis dissitis. *Glumae* inaequilongae (inferior plerumque 3.5–5 mm, superior plerumque 6–9 mm longa), lanceolatae vel angustae, apice saepe unidentatae, acutae vel acuminateae, saepe brevistaristatae, 3–5-nerviae, nervis leviter scabris. *Lemma* 10–12 mm longum, anguste lanceolatum, 5-nervium, nervis superne conspicuis, brevisetulosum, aristatum, arista (2)2.5–3.5(4) cm longa glacili plus minusve curvata basi dilatata. *Palea* lemmati subaequilonga, anguste lanceolata, apice obtusa vel emarginata, bicarinata, in parte dimidia superiore carinarum breviciliata, dorso apicem versus brevisetulosa. *Rhachilla* 2.4–2.8 mm longa, setulis perparvis tecta. *Antherae* flavae, plerumque 2.8–3.2 mm longae.

Ab affine *A. canaliculato* Nevski foliorum vaginae marginibus dense longiciliatis, laminis planis supra marginibusque sparse longipilosis ad auriculas plerumque dense longipilosis, spiculis 3–5(6)-floribus, glumis 3–5-nerviis, brevioribus, lemmate brevisetuloso, arista glacili, differt.

W. Himalaya: Nr. Simla, 7000–8000 ft, 23/8 1889, J. F. Duthie 10123 (holotypus in Herb. Kew).

***Agropyron x interjacens* Melderis, sp. hybr. nov.**

Gramen hybridum inter parentes putativos *A. canaliculatum* Nevski et *A. macrolepidem* Drobov medium. *Foliorum* vaginae inferiores dense brevipilosae; *laminae* 7–20 cm longae, usque ad 5 mm latae, supra brevipilosae, subtus glabrae leves. *Spica* laxiuscula, 9–10.5 cm longa, erecta. *Spiculae* 4–6-florae, leviter purpureo-tinctae. *Flosculi* steriles, semina non formantes. *Glumae* 7–11 mm longae, oblongo-lanceolatae, hyalino-marginatae, brevistaristatae. *Lemma* brevisetulosum, aristatum, arista 2.5–4.5 cm longa, suberecta vel leviter curvata. *Rhachilla* pubescens.

Pakistan: deux versants de l'Ishkuman Aghost, 4210–4540 m, 15–16/8 1954, F. Schmid 2430 (holotypus in Herb. Mus. Genev.).

***Agropyron kuramense* Melderis, sp. nov.**

Gramen perenne, 30–70 cm altum, caespitosum. *Culmi* graciles, 3-nodes, sub et in nodis brevissime pubescentes ceterum glabri leves. *Folia* glaucescentia; *vaginae* brevisetulosae, marginibus dense longipilosae; *ligulae* 0.2–0.4 mm longae, hyalinae, breviter pubescentes, apice truncatae laceratae; *laminae* 6–14 cm longae, 2–2.5 mm latae, planae, supra pilis longis sparsis tectis, marginibus scabriusculae, subtus glabrae leves. *Spica* laxiuscula, 3–9.5 cm longa (aristis exclusis), erecta vel subnutans; rhachis glabra levis sed marginibus breviciliata scabra. *Spiculae* 1–1.3 cm longae (aristis exclusis), anguste lanceolatae, plerumque 3-florae. *Glumae* subaequilongae (inferior 5–6 mm, superior 6–8 mm longa), anguste lanceolatae, angustissime hyalino-marginatae, apice acuminatae vel mucronatae, 1–5-nerviae, nervis scabriusculis. *Lemma* 6–8 mm longum, oblongo-lanceolatum, apicem versus distincte 5-nervium, superne brevisetulosum,

dorso glabrum, aristatum, arista (0.9)1–1.4(1.5) cm longa. *Palea* lemmati aequilonga, oblanceolata, apice plerumque rotundata, bicarinata, carinis apicem versus breviciliata, dorso in parte apicali brevisetulosa. *Rhachilla* strigosula. *Antherae* c. 2 mm longae.

Ab *A. semicostato* Nees ex Steud. foliorum vaginis marginibus dense longipilosis, rhachide glabra levi sed marginibus breviciliata scabra, spiculis minoribus, glumis minoribus 1–5-nerviis, lemmate brevior, palea lemmati aequilonga, differt.

Afghanistan: Kurrum Valley, fields near Kaiwās, Jul. 1879, J. E. T. Aitchison 709 (holotypus in Herb. Mus. Brit.).

***Agropyron microlepis* Melderis, sp. nov.**

Gramen perenne, 50–65 cm altum, gracile, caespitosum. *Culmi* glabri, leves, 2–3-nodes. *Foliorum vaginae* plerumque purpureo-tinctae, glabrae, leves; *ligulae* 0.3–0.5 mm longae, hyalinae, apice truncatae laceratae; *laminae* 11–18 cm longae, 2–4.5 mm latae (in foliis innovationum angustiores), virides, planae, supra in nervis sparse longipilosae, subtus glabrae leves. *Spica* laxa, 10–15 cm longa (aristis exclusis), nutans, gracillima; rhachis glabra levis sed marginibus breviciliata scabra. *Spiculae* 1.4–2 cm longae (aristis exclusis), angustissime lanceolatae, purpureo-tinctae, 4–5 (6)-florae, flosculis dissitis. *Glumae* parum inaequilongae (inferior 2.5–3 mm, superior 3.5–4.5 mm longa), anguste lanceolatae, apice acutae, plerumque 1–3-nerviae, nervis conspicuis scabriusculis. *Lemma* 8 mm longum, anguste lanceolatum, 5-nervium, nervis lateralibus superne inconspicuis, brevisetulosum, aristatum, arista 1.2–2 cm longa gracili erecta vel leviter curvata. *Palea* lemmati subaequilonga, apice obtusa vel truncatula, bicarinata, carinis apicem versus sparse breviciliata, dorso plerumque superne brevisetulosa. *Rhachilla* 2.5–3 mm longa, strigosula. *Antherae* violaceae, 1.5–2 mm longae.

Affinis *A. antiquo* Nevski a quo foliorum laminis supra sparse longipilosis, spiculis plerumque 5-floribus, flosculis versus glumas non intortis, lemmate 5-nervio, arista brevior erecta vel subcurvata, differt.

Nepal: between Mugu and Purana Mugu, Mugu Khola, on open stony slope, 13,000 ft, 20/8 1952, O. Polunin, W. R. Sykes and L. H. J. Williams 5325 (holotypus in Herb. Mus. Brit.).

***Agropyron nepalense* Melderis, sp. nov.**

Gramen perenne, 60–70 cm altum, caespitosum. *Culmi* sub spicis scabri, interdum sub et in nodis dense brevissime pubescentes ceterum glabri leves. *Folia* viridia; *vaginae* inferiores saepe pilis brevissimis tectae, superiores plerumque glabrae leves; *ligulae* brevissime, hyalinae, apice obtusae, laceratae; *laminae* 10–17 cm longae, 1–6 mm latae, planae, saepe utrinque nervis sparse longipilosae, supra marginibusque scabrae, subtus glabrae leves. *Spica* laxiuscula, 6–12 cm longa (aristis exclusis), erecta; rhachis dense brevisetulosa, marginibus brevicilata scabra. *Spiculae* 1.2–1.5 cm longae (aristis exclusis), virides vel plus minusve violaceo-

tinctae, oblongo-lanceolatae, 3-5-florae. *Glumae* inaequilongae (inferior 4-5.5 mm, superior 5.5-8 mm longa), anguste lanceolatae, angustissime hyalino-marginatae, apice acutae vel sensim acuminatae, 3-5(6)-nerviae, nervis conspicuis scabris. *Lemma* 8-9 mm longum, anguste lanceolatum, brevisetulosum, 5-nervium, nervis apicem versus conspicuis plus minusve violaceo-tinctis, aristatum, arista 1-2 cm longa erecta. *Palea* lemma subaequans vel paulo superans, anguste lanceolata, apice truncata vel leviter emarginata, bicarinata, carinis apicem versus breviciliata, dorso brevisetulosa. *Rhachilla* strigosa. *Antherae* flavae vel violaceae, 2-2.5 mm longae.

A. kuramensi Melderis arcte affinis sed distat culmis sub spicis scabris, foliorum vaginis marginibus non longipilosis, rhachide brevisetulosa, glumis 3-5(6)-nerviis, lemmate brevipiloso.

Nepal: Lumsa, N.W. of Jumla, open slopes, 9500 ft, 10/8 1952, O. Polunin, W. R. Sykes and L. H. J. Williams 5111 (holotypus in Herb. Mus. Brit.).

***Agropyron x nothum* Melderis, sp. hybr. nov.**

Gramen hybridum inter parentes putativos *A. dentatum* Hook.f. et *A. macrolepidem* Drobov medium. Planta robusta. *Foliorum vaginae* inferiores minute pubescentes; *laminae* 8-15 cm longae, 6-8 mm latae, planae, supra marginibusque scabriusculae, subtus glabrae leves. *Spica* densa, 8.5-9.5 cm longa (aristis exclusis), erecta. *Spiculae* 1.6-1.8 cm longae (aristis exclusis), virides, 4-5-florae. *Flosculi* steriles, semina non formantes. *Glumae* 1-1.2 cm longae, 1.8-2.4 mm latae, apice subito acuminatae saepe irregulariter dentatae breviaristatae. *Lemma* brevipilum, aristatum, arista 5-12 mm longa erecta.

Karakoram: Makerum, Hispar Glacier, dry bank, 12,500 ft, 1/8 1939, R. Scott Russell 1387 (holotypus in Herb. Mus. Brit.).

***Agropyron pamiricum* Melderis, sp. nov.**

Gramen perenne, c. 70 cm altum. *Culmi* graciles, glabri, leves, 2-3-nodes. *Folia* glaucescentia; *vaginae* glabrae, leves; *ligulae* c. 0.5 mm longae, hyalinae, apice truncatae, laceratae; *laminae* 14-17.5 cm longae, 2-2.5 mm latae, plus minusve convolutae, supra crassinerviae, nervis dense brevipubescentes, marginibus scabrae, subtus glabrae leves. *Spica* laxa, 13.5 cm longa, rigida, erecta; rhachis glabra levis sed marginibus breviciliata scabra. *Spiculae* 2 cm longae, anguste lanceolatae, 6-7-florae. *Glumae* inaequilongae (inferior 5.5-6 mm, superior 7-8 mm longa), anguste lanceolatae, hyalino-marginatae, apice sensim vel plus minusve subito acuminatae, brevissime aristatae, arista 0.5-0.8 mm longa, 3-5-nerviae, nervo mediano apicem versus scabro. *Lemma* 8.5-9 mm longum, anguste lanceolatum, 5-nervium, nervis superne conspicuis, basi et ad margines brevipilum, dorso glabrum, apice repando-lacerulatum exaristatum vel mucronulatum, mucrone 0.5 mm longo. *Palea* lemma aequans vel paulo superans, anguste lanceolata, apice truncata, bicarinata, carinis apicem

versus breviciliata, dorso glabra. *Rhachilla* strigosa. *Antherae* flavae, 4 mm longae.

Ex affinitate *A. cognati* Hackel sed spiculis majoribus, 6-7-floris, lemmate basi et ad margines brevipiloso dorso glabro, differt.

Pamir: 13,000-14,000 ft, 1895, *Alcock* 17795 (holotypus in Herb. Mus. Brit.).

***Agropyron russellii* Melderis, sp. nov.**

Gramen perenne, 40-70 cm altum, caespitosum. *Culmi* glabri, leves, 3-4-nodes. *Folia* viridia; *vaginae* inferiores plerumque pilis brevibus densis et longis sparsis intermixtis tectae, superiores glabrae leves; *ligulae* 0.2-0.3 mm longae, hyalinae, apice truncatae leviter laceratae; *laminae* 5-14 cm longae, 2-4 mm latae, planae, supra nervis crassiusculis approximatis, utrinque plerumque glabrae leves. *Spica* densiuscula, 6-15 cm longa (aristis exclusis), erecta vel subnutans; rhachis glabra levis sed marginibus breviciliata scabra. *Spiculae* 1.5-1.8 cm longae (aristis exclusis), oblongo-lanceolatae, plus minusve purpureo-tinctae, 3-5-florae. *Glumae* inaequilongae (inferior 6.5-8 mm, superior 8-11 mm longa), oblongo-lanceolatae, hyalino-marginatae, apice acutae vel plus minusve subito acuminatae, brevissime aristatae, arista 0.3-1.5 mm longa, 3-5-nerviae, nervis scabris. *Lemma* 1-1.2 cm longum, anguste lanceolatum, brevisetulosum, nervis apicem versus conspicuis, aristatum, arista 1-2 cm longa erecta. *Palea* lemmati subaequilonga, anguste lanceolata, apice acuto-emarginata, bicarinata, in parte dimidia superiore carinarum breviciliata, dorso in parte apicali brevisetulosa. *Rhachilla* strigosa. *Antherae* c. 2 mm longae.

Ab *A. schrenkiano* (Fisch. et Mey.) Drobov spicis non unilateralibus, glumis majoribus, aristis glumarum brevioribus, arista lemmatis erecta, differt.

Karakoram: Hispar Glacier, dry bank, 12,500 ft, 1/8 1939, *R. Scott Russell* 1388 (holotypus in Herb. Mus. Brit.).

***Agropyron sikkimense* Melderis, sp. nov.**

Gramen perenne, 70-80 cm altum, caespitosum. *Culmi* graciles, sub spicis scabri ceterum glabri leves. *Folia* viridia; *vaginae* glabrae, leves; *ligulae* 0.2-0.3 mm longae, hyalinae, apice truncatae laceratae; *laminae* 12-22 cm longae, 2-5 mm latae, planae, supra scabriusculae, subtus glabrae leves. *Spica* laxiuscula, 10-18 cm longa (aristis exclusis), erecta vel subnutans; rhachis glabra levis sed marginibus breviciliata scabra. *Spiculae* 1.3-1.8 cm longae (aristis exclusis), anguste lanceolatae, virides, 3-6-florae. *Glumae* subaequilongae (inferior 5-7.5 mm, superior 6-8.5 mm longa), anguste lanceolatae, anguste hyalino-marginatae, apice acutae, 3-5-nerviae, nervis scabris. *Lemma* 9-10 mm longum, anguste lanceolatum, in parte superiore brevisetulosum, dorso glabrum, 5-nervium, nervis inconspicuis, aristatum, arista 1.5-2.2 cm longa erecta. *Palea* lemmati aequilonga, anguste lanceolata, apice emarginata, bicarinata, saepe nervis breviter

excurrentibus, carinis breviciliata, dorso apicem versus brevisetulosa. *Rhachilla* strigosa. *Antherae* flavae, c. 2 mm longae.

Affinis *A. nepalensi* Melderis sed foliis glabris levibus, rhachide costis scabra marginibus breviciliata, lemmate apicem versus brevisetuloso dorso glabro, differt.

Sikkim: Lachen, reg. temp., 9000–10,000 ft, 2/8 1849, J. D. Hooker (holotypus in Herb. Kew).

***Agropyron* x *spurium* Melderis, sp. hybr. nov.**

Gramen hybridum inter parentes putativos *A. dentatum* Hook.f. et *A. russellii* Melderis medium, habitu *A. russellii* revocans. *Foliorum vaginae* glabrae, leves; *laminae* 5.5–10 cm longae, 2.5–3.5 mm latae, utrinque glabrae leves, marginibus scabrae. *Spica* densiuscula, 9 cm longa (aristis exclusis), erecta. *Spiculae* 1.3–1.5 cm longae (aristis exclusis), virides, purpureo-tinctae, 3–5-florae. *Flosculi* steriles, semina non formantes. *Glumae* 6–9 mm longae, oblongo-lanceolatae, hyalino-marginatae, apice plus minusve subito acuminatae, interdum irregulariter dentatae, brevistaristatae, 3–5-nerviae, nervis scabriusculis. *Lemma* 6–10 mm longum, brevipilosum, aristatum; arista 6–9 mm longa erecta.

Karakoram: Sokha Glacier, R. bank, open areas, 15,000 ft, 21/8 1939, R. Scott Russell 1627 (holotypus in Herb. Mus. Brit.).

***Agropyron stewartii* Melderis, sp. nov.**

Gramen perenne, 60–70 cm altum, caespitosum. *Culmi* glabri, leves, 3-nodes. *Folia* viridia; *vaginae* glabrae, leves; *ligulae* 0.2–0.3 mm longae, hyalinae, apice truncatae laceratae; *laminae* 3–6 cm longae, 1–2.5 mm latae, planae, tenuiter nerviae, supra nervis scabriusculae, marginibus scabrae, subtus glabrae leves. *Spica* laxiuscula, 7–11 cm longa, erecta vel subnutans; rhachis glabra levis sed marginibus breviciliata scabra. *Spiculae* (1)1.3–1.5(1.6) cm longae (aristis exclusis), lanceolatae vel anguste lanceolatae, virides, 3–4-florae. *Glumae* subaequilongae (inferior 5–7.5 mm, superior 6.5–8 mm longa), lanceolatae vel anguste lanceolatae, anguste albo-vel purpurascienti-marginatae, apice sensim acuminatae, brevistaristatae, arista 0.5–2 mm longa, 3–5-nerviae, nervo mediano scabriusculo. *Lemma* 8–10 mm longum, oblongo-lanceolatum, 5-nervium, nervis scabriusculum ceterum glabrum, brevistaristatum, arista (0.5)1–2(3) mm longa. *Palea* lemmate paulo brevior, anguste lanceolata, apice emarginata, bicarinata, carinis apicem versus breviciliata, dorso superne brevisetulosa. *Rhachilla* strigosa. *Antherae* flavae, 2–2.5 mm longae.

Ab affini *A. leptouro* (Nevski) Melderis, comb. nov. (*Roegneria leptoura* Nevski in Komarov, Fl. U.R.S.S. 2, 623, 1934), foliorum laminis planis 1–2.5 mm latis supra scabriusculis, glumis minoribus 3–5-nerviis, rhachilla strigosula, antheris brevioribus, differt.

Baltistan: near Kasurmik, Shyok watershed, 9000–10,000 ft, 15/8 1940, R. R. and I. D. Stewart 20704 (holotypus in Herb. Kew).

Agropyron striatum var. **validum** Melderis, var. nov.

Ab *A. striato* Nees ex Steud. var. *striato* spicis densis, glumis oblongo-lanceolatis vel late oblongo-lanceolatis firmis apice acutis vel obtusiusculis ad margines dense pubescentibus, lemmate ad margines et apicem versus pubescenti dorso plerumque glabro, arista brevior, differt.

Kashmir: Srinuggur, 7800 ft, 16/7 1876, C. B. Clarke 29116 A (holotypus in Herb. Kew).

Agropyron thoroldianum var. **laxiusculum** Melderis, var. nov.

Ab *A. thoroldiano* Oliver var. *thoroldiano* spicis laxiusculis 5-7.5 cm longis (aristis exclusis), glumis non longipilosis nervo mediano scabris, arista lemmatis 5-7 mm longa, differt.

S. Tibet: Khamba Jong, 8, 11/7 1903, F. E. Younghusband 32 (holotypus in Herb. Kew).

Agropyron tibeticum Melderis, sp. nov.

Gramen perenne, 70-100 cm altum, caespitosum. Culmi 3-4-nodes, nodis breviter pubescentes ceterum glabri leves. Folia viridia; vaginae inferiores dense brevisetulosae, superiores glabrae leves; ligulae 0.2-0.4 mm longae, hyalinae, apice truncatae laceratae; laminae 12-16 cm longae, 3-6 mm latae, planae, supra nervis sparse longipilosae, subtus marginibusque scabrae. Spica inferne interrupta, superne densiuscula, 10-16 cm longa (aristis exclusis), suberecta vel subnutans; rhachis glabra levis sed marginibus breviciliata scabra. Spiculae 1-1.6 cm longae (aristis exclusis), oblongo-lanceolatae, virides, (3)4-5-florae. Glumae parum inaequilongae (inferior 7-8.5 mm, superior 8.5-10 mm longa), oblongo-lanceolatae, anguste hyalino-marginatae, apice sensim acuminatae vel aristatae, arista usque ad 6 mm longa, 5-7-nerviae, nervis conspicuis scabris. Lemma 8-10 mm longum, anguste lanceolatum, 5-nervium, nervis superne conspicuis, apicem versus brevisetulosum, dorso glabrum, aristatum, arista 1-1.7 cm longa, erecta vel leviter curvata. Palea lemmati subaequilonga, anguste lanceolata, apice truncato-obtusa vel leviter emarginata, bicarinata, carinis breviciliata, dorso apicem versus brevisetulosa. Rhachilla strigosa. Antherae flavae, 2-2.3 mm longae.

Affinis *S. semicostato* Nees ex Steud. a quo rhachide glabra marginibus breviciliata scabra, palea lemmati subaequilonga apice truncato-obtusa vel emarginata, antheris brevioribus, differt.

S.E. Tibet: Kongbo Province, Timpa, Tsangpo Valley, 9700 ft, 6/7 1938, F. Ludlow, G. Sherriff and G. Taylor 5160 (holotypus in Herb. Mus. Brit.).

x Elymordeum schmidii Melderis, sp. hybr. nov.

Gramen hybridum inter parentes putativos *Elymum nutantem* Griseb. et *Hordeum turkestanicum* Nevski, habitu *H. turkestanici* sed spicis majoribus. Foliorum vaginae inferiores brevipilosae, superiores ad margines longipilosae ceterum glabrae leves; laminae dense brevipilosae. Spica

densa, 4–6.5 cm longa (aristis exclusis), 5.5–8 mm lata, erecta, purpurea vel viridis purpureo-tincta; rhachis fragilis. *Spiculae* (3)–2–(1) in nodo. *Flosculi* plerumque 2 in spicula (tertio reducto), omnes steriles, semina non formantes. *Glumae* 6–8 mm longae, lineares, basi dilatatae, 1-nerviae, apice sensim in aristam acuminatae. *Lemma* 7–9 mm longum, dense brevipilosum, aristatum; arista 5–10.5 mm longa, erecta. *Antherae* 2–2.2 mm longae, non dehiscentes.

Pakistan: Prov. de Chitral: haute vallée de Yarkhun. Hauts pâturages, 4000 m, 22–27/8 1954, F. Schmid 2334 (holotypus in Herb. Mus. Genev.).

***Elymus dahuricus* var. *micranthus* Melderis, var. nov.**

Ab *E. dahurico* var. *cylindrico* Franchet spica non cylindrica, lemmate 5–7 mm longo superne strigoso apice rotundato breviaristato, arista 3–6 mm longa, differt.

Pakistan: Bumbrat, 22/7 1956, J. J. Norris 25184 (holotypus in Herb. Kew).

***Elymus nutans* var. *albidus* Melderis, var. nov.**

Ab *E. nutanti* Griseb. var. *nutanti* rhachide pilosa, lemmate longipiloso, differt.

W. Himalaya: Kunawur, Soognam, circa agros, V. Jacquemont 1638 (holotypus in Herb. Kew).

***Eremopyrum buonapartis* var. *pakistanicum* Melderis, var. nov.**

Ab *E. buonapartis* (Spreng.) Nevski var. *buonapartis* spiculis majoribus (1.7–2.2 cm longis), glumis 1–1.7 mm longis aristatis, arista 1–2 mm longa, lemmate 1.2–1.7 cm longo aristato, arista 3–6 mm longa, differt.

Pakistan: Quetta, 5/5 1956, J. J. Norris 65a (holotypus in Herb. Kew).

Addenda

The following species and hybrid are additions discovered while this book was passing through the press.

Bromeae

Bromus madritensis Linn., Cent. Pl. 1, 5 (1755).

Festuca madritensis (Linn.) Desf., Fl. Atlant. 1, 91 (1798).

Anisantha madritensis (Linn.) Nevski in Act. Univ. Asiae Med. 8b, Bot. 17, 21 (1934).

Distribution: Native of the Mediterranean Region, extending to Afghanistan. It has been introduced into Australia and the Americas.

Exsicc.—Griffith 6692, Afghanistan.

This species is likely to be mistaken for *B. tectorum* Linn. but in the latter the panicle is drooping or the spikelets turned to one side with up to eight spikelets on the longer branches. In *B. madritensis* the panicle is stiffly erect and there are only one or two spikelets on the longer branches. The spikelets (with awns) are 2.5–3.5 cm long in *B. tectorum* and 3.5–6 cm long in *B. madritensis*.

Festuceae

Cutandia Willk. in Bot. Z. 18, 130 (1860).

Cutandia memphitica (Spreng.) ^{Benth. in Journ. Linn. Soc. Bot. 19: 118 (1841)} ~~Richt., Pl. Eur. 1, 77 (1890)~~.

Dactylis memphitica Spreng., Nachtr. Bot. Gart. Halle, 20 (1801).

Scleropoa memphitica (Spreng.) Parl., Fl. Ital. 1, 471 (1838).

S. caspica C. Koch in Linnaea 21, 409 (1848).

Distribution: Mediterranean Region, Middle East to Persia, Iraq to Afghanistan.

Exsicc.—Griffith 6624, Afghanistan.

Of the genera of *Festuceae*, *Cutandia* is closest to *Sclerachloa*, from which, however, it differs in its 3-nerved lemmas, and grooved, stout, pedicels and joints of its tri- and dichotomously branched panicle. A very distinct plant which, once seen, could hardly be confused with any other.

Aristideae

Aristida pennata Trin. in Mém. Acad. Sci. Pétersb. 6, 488 (1815) t. 10.

A. pungens Griseb. in Ledeb., Fl. Ross. 4, 451 (1852) non Desf. (1798).

A. pungens var. *pennata* (Trin.) Trautv. in Act. Hort. Petrop. 1, 17 (1871).

Distribution: South Russia, Persia, Turkestan and northwest Pakistan.

see
addenda

Exsicc.—One sheet collected by *Nushki* in Swat probably in 1958 but without date and without number.

This species will key down to *A. pungens* Desf. but the two are very different. In *A. pennata* the leaves are flaccid not pungent and the tip of the lemma is prolonged beyond the articulation as a hyaline membrane to the base of the awn. This latter feature is absent in *A. pungens*.

Triticeae

x ***Elymordeum bowes-lyonii*** Melderis, sp. hybr. nov.

Gramen hybridum inter parentes putativos *Elymum nutantem* Griseb. et *Hordeum brevisubulatum* (Trin.) Link medium. *Foliorum vaginae* inferiores longipilosae, pilis reflexis, superiores ad margines plus minusve pilosae ceterum glabrae leves; *laminae* 3–5 mm latae, supra nervis scabriusculae, marginibus scabrae, subtus glabrae, leves. *Spica* densiuscula, 6–9 cm longa (aristis exclusis), 5–7 mm lata, erecta, viridis purpureo-tincta; rhachis tenax vel vix fragilis. *Spiculae* 3–2 (1) in nodo. *Flosculi* 2–3 in spicula (uno reducto), omnes steriles, semina non formantes. *Glumae* 4.5–8 mm longae, lineares, basi dilatatae, l-nerviae, apice sensim in aristam acuminatae. *Lemma* 6–8 mm longum, in parte superiore brevisetulosum, dorso glabrum, aristatum, arista 6–8 mm longa, erecta. *Antherae* 1.5 mm longae, non dehiscentes.

Pakistan: Chitral: Turkho, sandy soil by the water channel, 29/6 1958, S. A. Bowes Lyon 1034 (holotypus in Herb. Mus. Brit.).

This hybrid resembles x *Elymordeum schmidii* Melderis, from which it differs in its lemmas which are glabrous on the back and scaberulous towards the tip. In x *E. schmidii* the lemmas are hairy on the whole surface. In x *E. bowes-lyonii* the lower leaf-sheaths are long-hairy, with stiff reflexed hairs, but those in x *E. schmidii* are densely short-hairy. The leaf-blades of x *E. bowes-lyonii* are glabrous, whilst those of x *E. schmidii* are densely short-hairy on both surfaces.

Hordeum brevisubulatum (Trin.) Link in *Linnaea* 17, 391 (1843).

H. secalinum var. *brevisubulatum* Trin., Sp. Gram. 1 (1828), tab. 4.

H. macilentum Steud., Syn. Pl. Gram. 1, 352 (1854).

Distribution: Southeastern part of the European U.S.S.R. (the Transvolga region), S.E. Iran, Pakistan, Central Asia, Tibet, Eastern Turkestan, Manchuria, Mongolia, Siberia.

Exsicc.—S. A. Bowes-Lyon 1032, Pakistan: Chitral: Turkho.

This species is closely allied to *H. turkestanicum* Nevski. It differs from the latter in having glabrous lemmas, which are more or less scaberulous towards the apex, whilst the lemmas in *H. turkestanicum* are hairy on the whole surface. In addition, the lateral florets in *H. brevisubulatum* are usually much better developed and staminate. In *H. turkestanicum* they are usually abortive, sterile, often about 1 mm long.

Zoysieae

Tragus berteronianus Schult., Syst. Veg. 2, Mant. 205 (1824).

This species has been found just inside the borders of Pakistan. It can easily be separated from *Tragus biflorus* Schult. by the smaller spikelets (2 mm. as against 4 mm long) and denser spikes.

Distribution: Tropical Africa, Arabia, Baluchistan.

Exsicc.—*Frere* s.n., Baluchistan; *Aitchison* s.n., Afghanistan.

Dignathia hirtella Stapf in Hook., Icon. Plant. sub. tab. 2950 (1911).

Distribution: East Africa and Italian Somaliland.

A specimen of this remarkable plant was collected recently in Cutch. Leg. *M.B. Raizada*.

It is an interesting new record for India.